

Venice, September 20 - 23, 2006

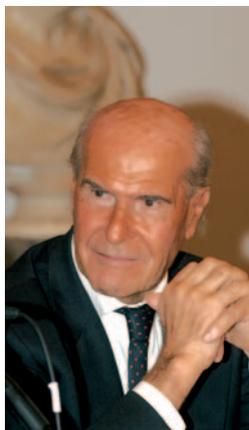
**THE FUTURE OF SCIENCE**



SECOND WORLD CONFERENCE

*Evolution*

Under the auspices of UNESCO



*Evolution is at the forefront of discussion in several spheres, ranging from astrophysics and genetics to philosophy and psychology. Reflection about evolution is in fact reflection about ourselves, our future and our place in the universe.*

*In the pursuit of the objectives set by the First World Conference on the Future of Science, we have chosen to explore this theme, crucial for science itself and for society as a whole.*

*The Conference will gather in Venice personalities of international renown from various disciplines, who will be involved each day in an open discussion with the participants.*

*The Conference is addressed not only to researchers and experts in these fields, but also to politicians, economists, managers, teachers, journalists and all women and men of culture, who wish to explore the impact of scientific knowledge on our lives and take part in delineating a new role for science in tomorrow's world.*

*Umberto Veronesi*  
Conference President



*Science does not determine the future, but does indicate the road ahead; science does not guarantee happiness but does provide conditions for a better life. It is our responsibility to explore that road ahead, to show how knowledge can be transformed into opportunities for progress; it is up to society as a whole to use the fruits of scientific research according to its ethical guidelines. The prerequisite for this is that science and society should communicate and understand each other better.*

*By organizing the Second World Conference on the Future of Science, the Umberto Veronesi, Giorgio Cini and Silvio Tronchetti Provera Foundations aim to promote that all-important dialogue. The success of the First Conference in Venice showed that a meeting that brought together world class speakers could spark interest, because of its trans-disciplinary and trans-cultural approach.*

*If, last year, there was a wide debate on relations between science, ethics, religion, economics and politics, this year's Conference promises to be of even greater interest, since its theme - Evolution - is highly topical, and extremely controversial. Aware of the contentious nature of this theme, we nevertheless feel it must be fully and openly debated, and in this we adhere to the spirit of the Venice Charter (endorsed by numerous participants at last year's Conference).*

*There is only one way to make progress on the big questions of today and that is by encouraging dialogue between diverse disciplines and scholarly traditions, diverse cultures and diverse civilizations. This year's Conference will again promote such a dialogue, engaging not only the experts but also the wider public. We believe that through such dialogue society as a whole can increase its awareness of the opportunities and challenges facing it, and build stronger foundations for the judgments and choices that will influence the future of all – a better future which science helps us to imagine.*

*Marco Tronchetti Provera*

*President of the Silvio Tronchetti Provera Foundation*



*An aim of the Second World Conference on the Future of Science that I wish to emphasize is its primary one of promoting dialogue between science and society.*

*This year's theme, evolution, is one of intrinsic interest and major relevance. It is also one which serves, like no other, to test the ability of scientists and humanists, believers and non believers, to engage in meaningful debate. The polarization between those who sustain evolution as one of the best-developed scientific theories and those who maintain the universe, life and humans are the work of an intelligent creator, is well known. My view is that attempts to deny the scientific evidence bearing on the fundamental questions of human origins and human destiny are futile. Science and faith should not be on a collision course over this issue: a careful epistemological analysis can resolve the controversy.*

*To ensure that scientific enterprise does not follow an aberrant path isolated from the the rest of society it is vital that other areas of thought concerned with humanity, its history and its destiny undergo the type of development that has characterized the sciences. If the humanist disciplines do not develop to the same extent as the scientific disciplines, the two cultures will continue to diverge with uncertain consequences for humanity as a whole.*

*This year's Conference, like the first, takes place at the Cini Foundation on the Island of San Giorgio, Venice. Other than hosting the event, the Cini Foundation's role in this ambitious cultural manifestation is to emphasize that scientific answers to big questions need to be integrated into the wider context of all human knowledge.*

*Giovanni Bazoli*  
President of the Giorgio Cini Foundation



*The Future of Science program was conceived to bring science back to the centre of the cultural and social debate.*

*The first event of the program, the First World Conference, held in Venice last September, was a resounding success and one of its fruits was the Venice Charter, a document signed by most Conference participants.*

*The Venice Charter aims to alert governments and public opinion to the opportunities provided by the continued growth of science while emphasizing the ethical problems raised by scientific advance and the need to confront them.*

*Those who endorsed the Charter have discarded the old view that science is ethically neutral-merely passing on its knowledge for others to use for the benefit - or harm - of humanity. It is necessary that the continuity of scientific thought with other disciplines be emphasized so as to develop a common reference point from which to examine the future.*

*The Second World Conference on the Future of Science is another step in this direction. Its theme - evolution - is one of intense interest to all, be they scientists or non-scientists. Over the three day Conference the evolution of matter, the evolution of life and the evolution of mind will be discussed: it will be a fascinating survey of the whole of existence from its remotest origins to its distant future.*

*Chiara Tonelli*  
Conference Secretary General

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Lavinia Galli

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DOGE'S PALACE - VENICE

**Wednesday, September 20, 2006**

## *Opening Ceremony*

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6.30 p.m.

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### *Welcome Addresses*

**Umberto Veronesi**

Conference President

**Marco Tronchetti Provera**

President of the Silvio Tronchetti Provera Foundation

**Giovanni Bazoli**

President of the Giorgio Cini Foundation

**Chiara Tonelli**

Conference Secretary General

The Opening Ceremony at Palazzo Ducale is a Special Conference Session in which eminent cultural, political and scientific personalities will comment on the objectives of The Future of Science Program and its 2006 theme - evolution, expounding their views on the implications of evolution for our lives, and for the society of tomorrow.

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*Opening Speeches*

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**Kathleen Kennedy Townsend**

Conference Vice President

**Jean-Jacques Aillagon**

Former French Ministry of Culture and Communication

**Courtney Ross**

President of the Ross Institute for Advanced Study and Innovation in Education

**Luc Montagnier**

President of the World Foundation for Aids Research and Prevention

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*Messages from Government Representatives*

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**Livia Turco**

Italian Ministry of Health

**Fabio Mussi**

Italian Ministry of Scientific Research



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SALA DEGLI ARAZZI

**Thursday, September 21, 2006**

## ***Evolution of Matter***

*The Universe from the Big Bang to the future*

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9.00 a.m. - 1.00 p.m.

Chair: Lodewijk Woltjer

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*Lisa Randall*

**The Evolution of the Universe**

*Paolo de Bernardis*

**Formation of first cosmological structures**

*Günther Hasinger*

**X-ray view of the formation of the first objects  
in the Universe**

*Margherita Hack*

**From megastars to galaxies, from galaxies  
to stars**

*Panel discussion*

Theories of the birth of the Universe, the formation of the first galaxies, stars and black holes, and their evolution to the present will be presented and discussed in the light of the latest observations. Most of the Universe seems to consist of mysterious dark matter and even more mysterious dark energy. A major challenge of present cosmological research is to understand the origin and roles of these invisible players in cosmic evolution, and how they determine the structure of the visible Universe. As in living organisms, the evolution of the Universe is determined by a continuous feedback from cosmological to star-size structures.

Gamma-ray bursts, detected throughout the Universe at rates of about one a day and lasting from a few milliseconds to several minutes, are incredibly violent signals of other mysterious events - perhaps the merger of neutron stars, the collapse of a massive star or neutron star-black hole binary. Metals, essential constituents of life on Earth, are ejected by exploding stars at the end of their lifetimes and provide raw material for the next generation of stars. New telescopes in space and on Earth are revealing ever more about the most distant and oldest parts of Universe and are scanning near stars for other solar systems.

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2.30 p.m. - 4.30 p.m.

Chair: Franco Pacini

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Giovanni Bignami

**Exploring our evolving Universe from Space**

Lodewijk Woltjer

**Exploration of the Universe from Earth**

Luigi Piro

**The brightest explosions in the Universe**

Willy Benz

**Extra-solar planets and the search for life**

*Panel discussion*

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5.00 p.m.- 6.30 p.m.

Chair: Telmo Pievani

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*Round Table*

**Evolution and Society**

*(in collaboration with Observa-Science in Society)*

*Participants: Gaspare Barbiellini Amidei, Massimiano Bucchi, Gilberto Corbellini,  
Marco Ferraguti, Giovanni Puglisi*

***The Evolution of the Universe***

**Lisa Randall**

Professor of Physics, Harvard University, Cambridge, MA, USA

Our understanding of cosmology, the science of the evolution of the universe, has changed dramatically over the last hundred years.

I will give an overview of the major theoretical and observational discoveries and our current understanding of the evolution of the universe through the hot big bang and cosmological inflation.

I will also discuss the outstanding mysteries in our understanding of some of the observations, chief among which are dark matter and dark energy.

I will give an overview of attempts to address these mysteries through new physical principles including extra dimensions and a multiverse landscape and the new ways of thinking about the science of cosmology that these might entail.

## ***Formation of first cosmological structures***

**Paolo de Bernardis**

Professor of Astronomy and Astrophysics, La Sapienza University, Rome, Italy

Nature has provided us with a powerful tool to study the early evolution of the Universe: the Cosmic Microwave Background (CMB).

Studying the detailed properties of the CMB it is possible to investigate different epochs in the evolution of the Universe.

The thermal energy distribution of the CMB strongly indicates that our Universe underwent a hot phase in the distant past: the primeval fireball.

During that period the Universe was incredibly dense and hot. It expanded and cooled until, 400000 years after the big bang and about 14 billion years ago, the first atoms formed, and the Universe became transparent. We can visualize directly that epoch obtaining an image of the CMB.

More than twenty years of experimental attempts worldwide have been recently successful. We have now an image of the Universe as it was 14 billion years ago. The image displays the imprint of density and temperature oscillations perturbing the primeval plasma. The complex jerarchy of stars, galaxies and clusters of galaxies visible in the nearby universe today is the result of those early perturbations, growing for 14 billion years under their gravity. The analysis of the statistical properties of the image of the CMB allows us to study the process of structure formation, and the geometry and composition of the Universe as a whole.

In the near future the polarization state of the CMB will allow us to study an even earlier phase of the evolution of the Universe: the hypothetical inflation phase, occurring a split-second after the big-bang, and involving physical processes at so high energies that they cannot be studied in Earth-based laboratories.

Current and forthcoming attempts to measure CMB polarization, and their potential to extend the physical description of the Universe closer to its origin will be discussed.

***From megastars to galaxies, from galaxies to stars*****Margherita Hack**

Professor of Astronomy and Astrophysics, University of Trieste, Italy

Which formed first: the galaxies or the stars? A question similar to: which was born first, the egg or the chicken? Stars form from gravitational collapse of cold molecular interstellar material present in interstellar molecular clouds, containing gas and dust (tiny particles mainly formed of graphite, silicates, ice) and which are important components of galaxies.

Hence until few years ago it was largely accepted that galaxies formed first and then the oldest massive stars (population III), containing only hydrogen and helium and small percentage of lithium, the only elements which were formed in the nuclear reaction occurring in the first minutes after the starting of the expansion of the Universe.

These massive stars are responsible for the formation in their core of all the elements, from helium to uranium and for the enrichment of the interstellar medium with these elements during the last explosive phases of their life.

None of these first generation stars has ever been observed.

The second generation stars (population II stars, which represent the oldest population of our galaxy and are mainly located in the halo) were formed from this molecular clouds and have abundances of heavy elements from 10000 to 10 times less than the solar one and the other relatively younger stars (population I) of our galaxy, mainly located in the galactic disk and in the spiral arms.

Recent observations of the cosmic microwave background from the NASA satellite WMAP (Wilkinson Microwave Anisotropy Probe) showing an image of the infant universe (at the age of 380000 years, while the present age, also determined by WMAP is 13 billions and 700 million years) have been able to detect polarization and its variation across the sky.

The polarization arose when the photons of the big bang afterglow collided with free electrons.

The electrons escaped from neutral atoms when re-ionization occurred, the dark age was over and the first stars emerged illuminating the Renaissance of the Universe, about 300 million years after the Big Bang, an interval of time much shorter than it was believed before these observations: gravity was more efficient than we have thought.

These primeval stars formed of hydrogen and helium only were very massive, about 100-to 200 more massive than the sun, bright like one million of solar type stars, and their life was very short, few million years.

Their explosive end like supernovae have enriched the Universe with the heavy elements which have permitted the formation of galaxies, molecular clouds, stars with their planetary systems, and all the elements necessary to living beings, like the calcium of our bones, the iron of our blood.

The formation and evolution of galaxies, the role of dark matter and the evolutionary path of stars like the sun and less massive ones as well as that of stars having masses eight or more times the solar mass are summarized.

Now we understand how the evolution of the Universe has permitted the formation of protons and neutrons, the hydrogen, deuterium and helium, then the first huge stars which exploding as supernovae have formed all the other elements, the chemical evolution of the Universe, the other stars with their planetary systems.

Darwin and modern improvement of his theories have shown how life has evolved from the simplest form to homo sapiens, a product of the evolution of the Universe who has the capacity to study and understand it.

The next goal is to understand how the great jump from the more complex molecules to the simplest leaving beings occurred.

***X-ray view of the formation of the first objects in the Universe*****Günther Hasinger**

Astrophysicist, Director Max-Planck Institute for Extraterrestrial Physics, Garching, Germany

The X-ray sky is dominated by a diffuse extragalactic background radiation, which our team, together with others, was able to resolve almost completely into discrete sources using the X-ray satellites ROSAT, Chandra and XMM-Newton - we observe the growth phase of the population of supermassive black holes throughout the history of the Universe.

Different feeding modes have been identified for growing black holes, starting from small flares occurring almost daily in our Galactic Center. In several other galaxies we discovered major flares, in which an otherwise dormant black hole tidally disrupts and swallows a normal star. Major mergers between two galaxies seem to play an important role in the feeding of black holes. In the nearby merger NGC 6240 we identified a double supermassive black hole in a single galaxy for the first time, which will merge in the future.

Indeed, the mass distribution of black holes in local galaxies is well traced by the evolution of the accreting black hole luminosity function. However, the maximum of high-luminosity objects occurs significantly earlier in the history of the Universe (at redshifts 2-3), than that of low-luminosity objects, which have a peak at redshifts below unity. This anti-hierarchical evolution is similar to the down-sizing effect observed in the optical galaxy population and still awaits a theoretical explanation.

At the end I will discuss new X-ray satellite projects.

## ***Exploring our evolving Universe from Space***

### **Giovanni Bignami**

Professor of Astronomy and Astrophysics University of Pavia, Italy  
Director Centre d'Etude Spatiale des Rayonnements, Toulouse, France

What was the succession of events after the Big Bang?

How were stars and galaxies formed? How did all of the cosmic evolution lead to life on Earth and possibly on other planets in our Galaxy and beyond?

Observations from space have been addressing such fundamental questions for the last half-century. Space observations complement and enormously improve the collection of information from celestial objects which astronomers have been pursuing for millennia from the ground, first with naked eyes and later, after Galileo, with telescopes.

The vast majority of the information which celestial objects send to us is contained in the electromagnetic radiation which they emit at all wavelengths.

Of these, only a tiny fraction reaches the surface of the Earth, a physical fact which limits astronomy from the ground, but which has allowed for life to develop on our planet. From space we have, for the first time, explored electromagnetic bands which carry such fundamental information on the physics of stars and galaxies as ground-based astronomy could never have imagined. Take the case, for example, of space X-ray astronomy, for the development of which Riccardo Giacconi was awarded the physics Nobel prize only a few years ago.

A whole new, violent Universe, populated by neutron stars, black holes and hot plasma was revealed, shedding light, for example, on the birth and death of stars, on the formation of galaxies and, in general, on unknown aspects of the evolution of our Universe. Space astronomy has already covered, with continuously improving sensitivity, most of the electromagnetic spectrum. It is now turning to non-electromagnetic channels, such as gravitational waves, for an even deeper and more physical view of celestial objects and their births and deaths.

Astronomy from space is now beginning to offer, and will do so much more in the near future, extremely powerful tools for the search of extrasolar planets. Nearly 200 have already been found close to "habstars" (stars around which life could be thinkable).

The plan, however, is to go further: within the next two decades, space astronomy expects to be able to deliver atmospheric spectra of the best candidate planets for the harbouring of life. It may be our first chance to prove the existence of extraterrestrial (if unreachable) life.

Last but not least, space astronomy has been doing in-situ exploration of practically all of the planets and of many other bodies in our solar system. It is a very promising way to get into actual physical contact with other life forms than those on Earth. If none is found alive today, the search may yield life traces from the past (especially on Mars), or discover the evolutionary environments and pathways leading to the formation of life.

***The brightest explosions in the Universe*****Luigi Piro**

Astrophysicist, Director of Research, Istituto Astrofisica Spaziale Fisica Cosmica, INAF, Rome, Italy

The revolution that has brought Gamma-Ray Burst from an obscure riddle to one of the hottest topic of Astrophysics and Cosmology is entering its tenth year anniversary.

An impressive sequence of discoveries, initiated on Feb. 28, 1996 with the Italian satellite BeppoSAX, has showed that they are the brightest and most distant explosion in the Universe.

They flag the birth of a powerful black hole following the cataclysmic death of stars in distant galaxies.

They are so distant that the light we observe today has traveled through the cosmos for several billions of years.

Discovered in the late sixties by a fleet of satellites devoted to monitor the nuclear ban treaty, Gamma Ray Burst are intense flashes of gamma-rays that appear suddenly in the sky about twice a day from random and unpredictable directions, last typically a few seconds and then vanish.

Without any clue about the distance, theoretical speculations as to the origin of these phenomena run wild.

In the seventies, more than a hundred of different models were published in the scientific literature, in fact more than the number of Gamma Ray Bursts detected at that time.

They ranged from comet impact onto neutron stars in the environs of the solar system to powerful stellar explosions in distant galaxies.

The problem was solved with the launch of the BeppoSAX satellite, an Italian mission with Dutch participation named after Giuseppe (Beppo) Occhialini, launched on April 30, 1996. Its instruments and ground operations were able to deliver fast and precise positions of these elusive events.

By rapidly re-orienting the satellite, it was then possible to search for any faint post-burst emission (named afterglow) with a set of more sensitive X-ray telescopes, that delivered crisper and deeper X-ray images. On Feb. 28, 1997, the first X-ray afterglow was detected, a fading and faint source marking the location of the bright and brief Gamma Ray Burst that had taken place 8 hours before.

This detection, the first of a long series, allowed the discovery of afterglows at optical and radio wavelengths and the measurement of the distance.

Gamma Ray Bursts harbour in galaxies at cosmological distances, several billions of light years.

These explosions fire powerful jets of material traveling near the speed of light. In a few seconds a Gamma Ray Burst emits much more energy than the sun does in its entire lifetime.

The energy of the explosion is likely produced by tapping the energy of a black hole generated in the final stages of the evolution of stellar systems: either the collapse of a very massive rotating star or the fiery crash of two merging neutron stars. Indeed, Gamma-Ray Burst come into two different ways.

The so called long events, lasting several seconds, have been convincingly associated to the first hypothesis. Clues to the origin of short Gamma-Ray Burst, flashes lasting a split second, had to wait the launch of the SWIFT satellite, a US-Italy-UK mission.

Last year SWIFT successfully identified the environs of short Gamma Ray Bursts supporting the idea that these events are connected with the coalescence of two neutron stars.

We are facing several challenges in the understanding of the evolution of our Universe. As a matter of fact, most of the energy and mass in our Universe is contained under the elusive forms of dark matter and dark energy, whose origin is still unknown.

As beacons scattered throughout the Cosmos, Gamma-Ray Burst are going to provide answers to some of the most exciting open questions related to the evolution of our Universe: the formation of the first stars and galaxies in the dark ages, when the Universe was obscure in the optical light, the evolution of the star formation with cosmic time, the origin of the dark energy, the formation and evolution of large cosmological structures driven by the dark matter.

***Exploration of the Universe from Earth*****Lodewijk Woltjer**

Professor of Astronomy and Astrophysics, Haute Provence Observatory, France

Observations of the Universe from space and from the ground are complementary. Where the atmosphere is opaque as in the infrared, ultraviolet, X- and gamma-rays we have no choice but to go into space.

But at radio wavelengths where very large telescope arrays are needed, at visible wavelengths when large telescopes are required or when we look for neutrinos that interact little with matter or for the mysterious extreme energy particles that strike a square kilometer only once per century, we have to remain on the ground.

It was at radiowavelengths that quasars were discovered that first showed that the Universe is strongly evolving.

Many quasars were formed in the early Universe and few are left today.

They are evidence of the black holes that formed and grew, and which put, with high efficiency, much energy into energetic particles.

Even though the numbers of black holes are very much smaller than those of stars, this high efficiency makes them very conspicuous and important for the evolution of the Universe.

With the present generation of large optical telescopes also much has been learned about the formation and evolution of the population of more normal galaxies.

In the future also much information may be obtained from gravitational waves and neutrinos which for the moment are largely terra incognita.

## ***Extra-solar planets and the search for life***

**Willy Benz**

Professor of Physics and Astrophysics, University of Berne, Switzerland

At the time of this Conference, slightly over ten years after the first announcement by Mayor and Queloz (1995), 200 planets orbiting stars similar to the sun (exoplanets or extra-solar planets for short) have been discovered.

From the beginning, they have shattered the understanding of the formation of planetary systems that had been patiently constructed based upon the study of a single example: our own solar system.

The diversity amongst the new systems, by baffling the earlier concepts, has reminded us how dangerous it can be to build theories on a single example.

At a time when searching for life as we know it becomes possible, this is serious reminder to keep our approaches as unbiased and open as possible.

Almost all of these 200 exoplanets have been discovered indirectly (essentially by monitoring the radial velocity of the star) and have not actually been seen. Hence, for most of them we know only the orbital parameters and a minimum mass from which we deduce that they resemble more Neptune or Jupiter than the Earth.

In the few cases where the planet is actually transiting the star, more information can be derived such as the radius and mean density from which we infer that they are actually gaseous planets.

Hence, while 200 exoplanets may seem a lot, they do not yet provide the physical insight that would allow us to thoroughly understand their formation and evolution.

This lack of a good understanding creates two major problems.

First, we cannot explain what is observed and second; we cannot predict what should be observed. The latter is especially severe at a time when major new ground- and space-based instrumentation is being discussed to detect and image smaller planets.

Indeed, large efforts are being undertaken worldwide to develop ground-and space-based platforms that should allow a direct detection of exoplanets with the ultimate goal of detecting and studying earth-like planets.

Once this is achieved, the search for life can truly begin.



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SALA DEGLI ARAZZI

**Friday, September 22, 2006**

## ***Evolution of Life***

*Darwinism in the light of modern genetics*

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9.00 a.m. - 1.00 p.m.

Chair: Peter Atkins

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*Edoardo Boncinelli*

**Biological evolution today**

*Denis Duboule*

**Genomes and Evolution**

*Ian Tattersall*

**Patterns in human evolution  
and the human biological future**

*Tecumseh Fitch*

**The Brotherhood of Species  
and the Future of Biology**

*Luigi Luca Cavalli Sforza*

**Interplay of genetics and culture**

*Panel discussion*

Terrestrial life originated through the long process of evolution. Many tantalising details of this process are unknown, but much is very well known indeed. The general principles, expressed in the neodarwinian synthesis, are the best scientific explanation currently available.

Evolution remains a very active field of research. Long stretches of the genomes of numerous species are available, and the number of genomes that have been completely sequenced is growing rapidly, enabling detailed comparison of nucleotide sequences of species as distantly related as fungi and chimpanzees, and providing new insights into evolutionary relationships and the process of evolution itself.

These insights will be discussed by researchers from various disciplines, with particular emphasis on what is known about the appearance of humans on Earth and the stages of human evolution.

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2.30 p.m. - 4.30 p.m.

*Chair: Edoardo Boncinelli*

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*Round Table:*

**Evolution in Science and Culture**

*Participants: Daniel Dennett, Irenäus Eibl-Eibesfeldt, Tecumseh Fitch, Marc Hauser, Steven Pinker, Ian Tattersall,*

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5.00 p.m. – 6.00 p.m.

**AIRC Conversation: Evolution and Cancer**

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*Participants: Edoardo Boncinelli, Giulio Giorello*

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8.00 p.m.

*Concert Scuola Grande di San Rocco*

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***Biological evolution today*****Edoardo Boncinelli**

Professor of Biology and Genetics, Vita-Salute University, Milan, Italy

Biological evolution is the evolutionary process we know best and the prototype of every other evolution. We have been speaking of it for the past 150 years or so. The underlying theory went through many phases, necessary for the continual accumulation of biological findings, but all these versions share a couple of fundamental tenets, to be traced back to the seminal formulation of Darwin.

First, all living organisms derive from the same group of ancestral organisms populating some regions of the earth almost four billion years ago. Second, all this took place mostly by virtue of the interplay of two irreducible forces we call random mutation and natural selection.

Owing to the first phenomenon, in every species in every moment arise always new types of individual organisms, slightly or seriously different from the previous ones. On this basis the environment assigns to the different types of organisms different capabilities to leave viable descendants: some leave many descendants, some very few or none. This essentially automatic selection exerted by the local environment has been termed natural selection. The interplay of these two forces explain essentially all the biological events we have been observing through years.

Many discoveries took place in the past decades, including unravelling the material basis of inheritance and the associated genetic rules. We know what genes are, how they act, and how they may change through mutation. In very recent years we were also able to determine the entire sequence of our genome, bearing our own genetic endowment, and the sequence of the genome of several other organisms.

These studies brought new blood to the body of evolutionary considerations and collectively constitute today the strongest evidence for the entire evolutionary process. I will deal with all of this and briefly describe new conceptual acquisitions that make the evolutionary theory a powerful, lively and ever improving research tool for everybody working in biology and, at least to me, for everybody caring of the understanding of life itself.

## ***Patterns in human evolution and the human biological future***

**Ian Tattersall**

Division of Anthropology, American Museum of Natural History, New York, USA

In attempting to predict what lies ahead futurologists have regularly looked to the past, in order to characterize and then to extrapolate established trends. This has been particularly true of those concerned with the human biological future. *Homo sapiens* is a very unusual species physically, but is even more so cognitively, with the result that futurological attention has been focused largely on trends in brain size over the span of human evolution.

Overall, the evidence indicates a sharp and sustained increase in hominid brain size over the past two million years or so; but the growing fossil record also shows that the human story has not simply been one of increasing complexity within a single lineage. Instead, the signal is one of diversity, of evolutionary experimentation involving numerous species originations and extinctions. And it is highly likely that the apparent trend toward increasing brain size reflects the differential success of larger-brained species rather than within-lineage fine-tuning of cognition. And if so, bigger brains (and improved cognition) are simply not on the cards for tomorrow's *Homo sapiens*.

This makes sense in light of the fact that natural selection can be attribute-focused only under highly limited circumstances; and in turn it makes it both necessary and possible to suggest a more plausible mechanism than selective pressure for the unprecedented transition of *Homo sapiens* from a nonsymbolic and nonlinguistic precursor condition to its unprecedented cognitive status today. Similarly, a survey of innovation in hominid evolution, technological as well as physical, indicates that change was both rare and highly episodic in the human past. Stasis rather than change has characterized the vast preponderance of human evolutionary time; and with today's vast and burgeoning human population the necessary preconditions for the fixation of evolutionary novelties in the human population simply do not exist.

Change is indeed occurring today, at unprecedented rates; but it is doing so on the technological rather than on the biological level, involving our ongoing exploration of a biological capacity that already exists. In view of all this, short of some all-too-easily imaginable calamity that dramatically reduces and fragments the human population we cannot hope for evolutionary forces to intervene to improve our future prospects. Our long-term survival thus depends on our learning to live with ourselves as we are.

ABSTRACT

***Interplay of genetics and culture*****Luigi Luca Cavalli Sforza**

Professor of Human Genetics, Stanford University, CA, USA

Genetics has given a major contribution to the understanding of human evolution.

The first genes studied extensively in human populations were blood groups, and in the sixties it was possible to reconstruct the first genealogical tree of the last 100,000 years of human evolution, which was greatly extended first by the study of proteins, and after the eighties, by the direct analysis of the hereditary material itself, DNA. Genetics allows to evaluate evolutionary times by the quantitative study of genetic change (i.e. mutation rates), and the comparison of genetic separations with archeological information, which shows good agreement with the genetic models. Modern humans appear in the archeological record in the last 150,000 years, in East Africa, and expanded outside Africa in the last 50-60,000 years ago.

The study of two chromosomes, a small one present in mitochondria, (self reproducing particles present in all cells, and transmitted by mothers), and the Y chromosome, present only in males and transmitted from fathers to sons, has been extremely useful for tracing human migrations in the expansion.

Clearly the development of language must have contributed greatly to the multiplication and the consequent expansion and differentiation of what genetics indicate was a relatively small original tribe in East Africa.

Imagination must have promoted a number of inventions, among which navigation, which allowed to reach Oceania from south east Asia at least 40,000 years ago, and improvement in the shape, efficiency and variety of tools.

People lived originally by the economy of hunting and gathering, but population densities reached saturation in some especially favorable areas and stimulated the domestication of plants and animals in order to produce food and decrease our dependence on nature.

This technological breakthrough permitted further population increases (earliest example in Syria, 11500 year ago) bringing about sedentariness, urbanization, social hierarchies, and new expansions and inventions.

Some 5000 years ago the entry into the age of metals, and the domestication of the horse stimulated transportation, warring on a larger scale, and a great number of other inventions including writing.

Cultural contacts and new developments were since the very beginning of our species, *Homo sapiens sapiens*, the stimulus to the accumulation and transmission of knowledge and skills made possible by brain development, especially aided by a mature language.

Cultural evolution is common in many animals but in no one has reached the degree of development found in humans: it now influences our genetic evolution and that of all the other species.

One can show that cultural evolution is directed by forces of change formally similar to those that determine biological evolution (mutation in biology, inventions in culture are the source of novelties), of selection (natural, and cultural selection) drift (the effect of chance), and migration.

But cultural evolution has reached extraordinarily high speed, because the transmission of ideas, unlike that of DNA changes, is not limited to that from parents to children, but can easily take place (thanks to language) between unrelated people.

Many late technological developments have enormously increased transmission rates, up to the current globalization mediated by the internet.

Today biological evolution is not a "hypothesis", but a certainty, and genome studies permit to describe in complete detail all the steps that took place in nature. It is also becoming clear that random genetic drift, the effect of variation of the number of children due to a multitude of causes, and the relative smallness of population size, plays a major role in biological evolution.

This, and the randomness of mutations show chance has a large part in it. Even so, natural selection, the property of self-reproducing entities, directs the automatic and inevitable transformation, differentiation and complexification of species to fit better and better the environment, and also to change it.

But one of its products, the human brain, has produced other self-reproducing entities: ideas. Will cultural evolution take the upper hand on biological evolution?

***The Brotherhood of Species and the Future of Biology*****Tecumseh Fitch**

School of Psychology, University of St. Andrews, Scotland, UK

One of the most fundamental discoveries of modern biology is the surprising depth of our genetic relationship with all other living things on this planet.

The genetic code itself is common to all living things.

All of the fundamental molecular mechanisms of the cell are shared with all other multicellular organisms, from plants and mushrooms.

Our closest relatives, the other vertebrates (fish, birds, mammals and others), share most of the same genes, a developmental "toolkit", and a nearly identical nervous system plan with human beings.

The degree to which humans are built on the same plan, using the same processes and genes present in other animals, came as a complete shock to biologists, but is now a universally-accepted fact.

The multi-faceted kinship of humans and animals is not only stunning confirmation of Darwin's theory of evolution, but provides a rich source of data for deepening our understanding of ourselves and our own evolution.

I give some examples from my own work showing that even unique aspects of our species, such as speech and language, can be better understood via comparisons with other species.

I suggest that an acceptance and understanding of our kinship with other organisms has, in addition to major scientific importance, some crucial ethical and philosophical implications as well. In the future, an enriched dialogue between biologists and the rest of society is required if humans are to make rational decisions about the environment, genetic engineering, medical innovation and ethical treatment of animals.

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ISLAND OF SAN GIORGIO MAGGIORE  
GIORGIO CINI FOUNDATION  
SALA DEGLI ARAZZI

**Saturday, September 23, 2006**

***Evolution of Mind***  
*A natural history of culture*

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9.00 a.m. - 1.00 p.m.

Chair: *Giulio Giorello*

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*Steven Pinker*

**The Cognitive Niche**

*Marc Hauser*

**Evolution of a Universal Moral Grammar**

*Michael Gazzaniga*

**Are Human Brains Unique?**

*Antonio Damasio*

**The Emotions in Evolution:  
a Neurobiological Perspective**

*Irenäus Eibl-Eibesfeldt*

**Final remarks**

*Panel discussion*

During the Upper Palaeolithic revolution (about 50,000 to 10,000 years ago) humans developed a new set of skills and activities: cave art, body ornamentation, human burials and other rituals - unmistakable signs of a symbolic intelligence fundamentally like our own.

There is evidence, however, that many of the elements of modern human behaviour can be traced even further back in time.

The birth and evolution of the modern mind is a mainly archaeological discipline receiving contributions from other sciences including comparative genetics, neurobiology and ethology. It is generally thought that spoken language is a key to understanding this explosive evolution of human culture.

The session will cover human intelligence in comparison with that of species closely related to us, the biological bases of human language, the minimum common structure of any language, the origin of magical thought in humans, and the birth and development of moral and religious sensitivity. These topics naturally encompass many classic questions about human nature, free will, sociality, the development of technology, and our future evolution.

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2.30 p.m. - 4.30 p.m.

Chair: *Marcelo Sánchez Sorondo*

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*Tomaso Poggio*

**Finally: coevolution of neuroscience and AI?**

*Maurizio Martelli*

**A Computer Science Perspective**

*Philip Pettit*

**The Evolution of Norms**

*Daniel Dennett*

**The Domestication of the Wild Memes of Religion**

*Panel discussion*

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5.00 p.m.

**Closing Ceremony**

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## ***The Cognitive Niche***

**Steven Pinker**

Johnstone Family Professor, Depart. of Psychology, Harvard University, Cambridge, MA, USA

I present the hypothesis that human language and reasoning are adaptations that evolved by natural selection for communication in a knowledge-using, socially interdependent lifestyle, the "cognitive niche." The theory, first outlined by John Tooby and Irven DeVore, explains the many human traits that are unusual in the rest of the living world. They include our extensive manufacture of and dependence on complex tools, our wide range of habitats and diets, our extended childhoods and long lives, our hypersociality, our complex patterns of mating and sexuality, and our division into groups or cultures with distinctive patterns of behaviour.

According to the theory, this human lifestyle is a consequence of a specialization for overcoming the evolutionary fixed defences of plants and animals (poisons, coverings, stealth, speed, and so on) by cause-and-effect reasoning. Such reasoning enables humans to invent and use new technologies (such as weapons, traps, coordinated driving of game, and ways of detoxifying plants) that exploit other living things before they can develop defensive countermeasures in evolutionary time. This cause-and-effect reasoning depends on intuitive theories about various domains of the world, such as objects, forces, paths, places, manners, states, substances, hidden biochemical essences, and other people's beliefs and desires.

Language fits into the picture as follows. The information captured in these intuitive theories is paralleled by the information that the machinery of language is designed to convert into strings of sounds. It is no coincidence that humans are special in their ability to outsmart other animals and plants by cause-and-effect reasoning, and that language is a way of converting information about cause-and-effect and action into perceptible signals. A distinctive and important feature of information is that it can be duplicated without loss. (If I give you a fish, I do not have the fish, but if I tell you how to fish, it is not the case that I now lack the knowledge how to fish.) A species that has evolved to rely on information should thus also evolve a means to exchange that information.

Language multiplies the benefit of knowledge, because a bit of know-how is useful not only for its practical benefits to oneself but as a trade good with others. Using language, a person can exchange knowledge with somebody else at a low cost to himself and hope to get something in return. It can also lower the original acquisition cost-people can learn, say, how to catch a rabbit from someone else's trial and error, without having to go through it themselves.

On this view, then, three key features of the distinctively human lifestyle - know-how, sociality, and language - co-evolved, each constituting a selection pressure for the others.

## ***Evolution of a Universal Moral Grammar***

### **Marc Hauser**

Professor of Psychology, Organismic & Evolutionary Biology and Biological Anthropology,  
Harvard University, Cambridge, MA, USA

In this talk I argue that the traditional approaches to thinking about the sources of our moral judgments emotions and consciously rational decisions have failed to explain the patterns we observe, and have led to failed policies in law and religion.

Here I present an alternative, building on an analogy to language. We have evolved a moral instinct, a capacity that naturally grows within each child, designed to generate rapid judgments about what is morally right or wrong based on an unconscious grammar of action.

Part of this machinery was designed by the blind hand of Darwinian selection millions of years before our species evolved; other parts were added or upgraded over the evolutionary history of our species, and are unique both to humans and to our moral psychology.

To showcase the workings of our moral faculty, I synthesize recent research on the universality of our moral judgments, together with results from patient populations that reveal the architecture of the moral organ.

ABSTRACT

***Are Human Brains Unique?*****Michael Gazzaniga**

Director Sage Center for the Study of Mind, Uni. of California, Santa Barbara, CA, USA

When a variety of findings from neuroscience and cognitive neuroscience are considered together, one sees the cortical arena as a patchwork of specialized processes that work in a more or less automatic way.

When this is considered in light of new studies on lateralization of human functions, it becomes reasonable to suppose that the corpus callosum enabled the development of the many specialized systems in humans by allowing for the reworking of existing duplicate cortical areas while preserving the existing function.

Thus, while language emerged in the left hemisphere at the cost of duplicate pre-existing perceptual systems, the critical feature of the perceptual system were spared in the opposite half brain.

By having the callosum serve as the great communication link between redundant systems, a pre-existing system could be jettisoned in one hemisphere, while the other hemisphere could continue to perform the prior functions for both half brains.

Split-brain studies have also revealed that the complex mosaic of mental processes that result, nonetheless leave us with the subjective experience of feeling totally integrated.

Indeed, even though many of these specialized functions have an automatic quality to them and are carried out by the brain prior to our conscious awareness of them, our subjective belief and feeling is that we are in charge of our actions.

These phenomena appear related to the uniquely human left hemisphere "interpreter", a device that allows us to construct theories about the relations between perceived events, actions and feelings.

Anatomical, physiological and behavioral studies will be presented that support these views on the uniqueness of the human brain.

## ***Finally: coevolution of neuroscience and AI?***

### **Tomaso Poggio**

Eugene McDermott Professor, Computer Science and Artificial Intelligence Lab, M.I.T.  
Cambridge, MA, USA

Understanding the processing of information in our cortex is a significant part of understanding how the brain works, arguably one of the greatest problems in science today. In particular, our visual abilities are computationally amazing and we are still far from imitating them with computers.

Thus, visual cortex may well be a good proxy for the rest of the cortex and indeed for intelligence itself. But despite enormous progress in the physiology and anatomy of the visual cortex, our understanding of the underlying computations remains fragmentary.

This position paper is based on the recent, surprising realization that we may be on the verge of developing an initial quantitative theory of visual cortex, faithful to known physiology and able to mimic human performance in difficult recognition tasks, outperforming current computer vision systems.

The proof of principle was provided by a preliminary model that, spanning several levels from biophysics to circuitry to the highest system level, describes information processing in the feedforward pathway of the ventral stream of primate visual cortex.

The thesis of this paper is that neurally plausible computational models are beginning to provide powerful new insights into the key problem of how the brain works, and of how to implement learning and intelligence in machines.

Thus neuroscience may indeed begin to exert a strong pull on the evolution of artificial intelligence.

ABSTRACT

## ***A Computer Science Perspective***

**Maurizio Martelli**

Professor of Informatics, Dean Faculty of Sciences MFN, University of Genoa, Italy

Either implicitly or explicitly, as in Hume's "Cognition is Computation", the debate on the relationship between mind and machine has been intriguing, and has contributed deeply to many different fields.

The possibility of Artificial Intelligence is obviously a hot topic in this debate; many questions arise and few answers can be considered definitive.

Key points to understand are: how and why our mind has evolved into what we are, the forms of knowledge of animals with respect to men, what are the building blocks of intelligence. In this effort, computer science, and specifically logics and programming languages theory, may contribute at least to pose some interesting questions.

Spoken languages are considered to underly any theory of the evolution of mind. It is interesting to see if and how the notion of "abstraction", which is crucial in mathematics and computer science, can play a more general role in our understanding of the mind.

The birth of logic came from abstracting a form of reasoning from many instances of it. Programming languages have similar roles up to a very high level of expressions. The notion of object, besides being with the notion of class a powerful computational tool, can contribute to deep philosophical discussions, as in "On the origin of objects" of B.C. Smith.

Abstraction is at the base of our representation of concepts and it allows us to "recognize" if an instance fits into a class. But what happens when we raise the level of abstraction and, for example, are capable of having a finite representation of infinite entities? Are animals capable of that?

When we use higher levels of abstraction, as in higher order logic and metalevel theories, we can represent both the "ego" and the "others", thus obtaining some sort of social ability (it seems that autism is caused by some sort of damage to this capability).

At the end the question could be: when and how we pass from a procedural (or analogic) knowledge representation to an explicit, declarative and higher order one?

## ***The Evolution of Norms***

**Philip Pettit**

L.S.Rockefeller University Professor of Politics and Human Values, Princeton University, NJ, USA

If enforcement of a certain norm is necessary, so it appears, that is because human beings are not generally public-spirited in the domain of the norm.

But in that case they will not in general be sufficiently public-spirited to enforce the norm.

Hence “the enforcement dilemma”: if norm-enforcement is necessary, it won't be forthcoming; and if it is forthcoming, it won't be necessary.

But the dilemma is spurious. Human beings care about the opinion and esteem of others and can often tell what others think of their conduct, even when others say or do nothing to praise or censure it.

Hence, if a standard of conduct is generally recognized as desirable in a community, there may be an involuntary mode of enforcement available for keeping defectors in line.

Without saying or doing anything in praise or censure of one another, members of the community may police one another into compliance with the standard.

ABSTRACT

***The Domestication of the Wild Memes of Religion*****Daniel Dennett**

University Professor and Austin B. Fletcher Professor of Philosophy, Director Center for Cognitive Studies, Tufts University, Medford, MA, USA

Organized religions are brilliantly designed social systems.

Reverse engineering them suggests that some of their features are ancient, and have no authors, while others are the more or less deliberate brainchildren of religion-designers and these answer to rather different selection pressures.

Like features under sexual selection, which are shaped by interactions with the perceptual and cognitive systems of potential mates, some features of organized religions are “intelligently” selected.

But still, Orgel's Second Rule applies: evolution is cleverer than you are.

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**Jean-Jacques Aillagon**

Former French Ministry of Culture,  
General Director Palazzo Grassi, Venice, Italy

Born in 1946 in Metz, Jean-Jacques Aillagon has been successively deputy director of the Ecole Nationale des Beaux-Arts in Paris (1979-1982), manager of the Musée National d'Art Moderne (1982-1985), cultural events representative for the City of Paris (1985-1991), cultural affairs director for the City of Paris (1992-1996), and director of the Georges Pompidou Centre (1996-2002).

In May 2002, he was appointed Minister for Culture and Communication, a position he would occupy until March 2004. In April 2005 he was chosen as general director and president of TV5 Monde and president of Transtéle Canal France International (CFI).

He leaves these positions in April 2006 to accept François Pinault's offer of the post of general director of Palazzo Grassi.



## Peter Atkins

Professor of Chemistry, Oxford University, UK

Peter Atkins began his academic life as an undergraduate at the University of Leicester, and remained there for his PhD. He then went to the University of California, Los Angeles as a Harkness Fellow and returned to Oxford as lecturer in physical chemistry and fellow of Lincoln College in 1965, where he has remained ever since, now as professor of chemistry. He has received honorary doctorates from universities in the United

Kingdom (Leicester), the Netherlands (Utrecht), and Russia (Mendeleyev University, Moscow) and has been a visiting professor at universities in France, Japan, China, New Zealand, and Israel.

His research was in the application of quantum mechanics to chemical problems and theoretical aspects of magnetic resonance, but with time he drifted into writing books, which now number about 55. The best known of these is *Physical Chemistry*, now in its eighth edition; that text became an instant best-seller when it was first published in 1978 and has remained that ever since; it is used throughout the world and has been translated into many languages.

His other major textbooks include *Inorganic Chemistry*, *Molecular Quantum Mechanics*, *Physical Chemistry for the Life Sciences*, *Elements of Physical Chemistry*, and various flavours of *General Chemistry*. He also writes books on science for the general public, including *The Periodic Kingdom*, *The Second Law*, and *Creation Revisited*. One of these books, *Molecules*, was described as 'one of the most beautiful chemistry books ever written'. A recent book for general audiences is *Galileo's Finger*, which gives an account of his selection of the ten great ideas of science

In his spare time he is deeply involved in a variety of international activities, including (until the end of 2005) chairing the Committee on Chemistry Education of the International Union of Pure and Applied Chemistry - the governing body of the subject - which has the task of improving chemical education worldwide, especially in developing countries, and encouraging and coordinating international efforts towards the public appreciation of chemistry. He also helps to organize the Malta series of conferences, which bring together chemists from the Middle East.

**Gaspare Barbiellini Amidei**

Professor of sociology, writer and journalist, Italy

A writer and a journalist, Gaspare Barbiellini Amidei is Professor of Sociology of knowledge at the Università degli Studi, Milan.

Editorialist of daily "Corriere della Sera", was for many years deputy editor in chief of "Corriere della Sera" and then editor in chief of "Il Tempo".

For many years he has also edited the section "I nostri ragazzi" on the weekly magazine "Oggi".

He published various books about parents-children relationship. He also wrote about current religion issues, particularly in "Dopo Maritain", "Il minusvalore", "La riscoperta di Dio", and more recently in "New Age, Next Age".



## Willy Benz

Professor of Physics and Astrophysics, University of Berne, Switzerland

Born in 1955 in Neuchâtel (Switzerland), Willy Benz studied physics at the local University before starting a PhD in astrophysics at Geneva University under the guidance of Prof. M. Mayor. Following the completion of his PhD in 1984, he spent several years in the USA first as a postdoctoral fellow at Los Alamos National Laboratory then as a junior faculty at Harvard University and finally as a senior faculty at the University of Arizona.

His research interests in theoretical astrophysics are broad, ranging from high-energy astrophysics to the formation and evolution of planetary systems.

Together with A.G.W. Cameron, he published the first simulations showing that the Earth's Moon could have originated as a result of a giant impact. He showed that Mercury could have suffered a similar event, which could explain the planet's anomalous large iron core. With S.A.C. Colgate and following the seminal work of H. Bethe, he published several papers on the role of convection in supernovae explosions. Finally, with E. Asphaug, he developed a model of brittle fracture of rocks, which allowed them to derive the physical characteristics of comet Shoemaker-Levy 9 following its crash onto Jupiter.

In 1997, he was called back to Switzerland and became a Professor at the Physikalisches Institut of the University of Bern in Switzerland where he is acting director since 2002. Together with M. Mayor at Geneva Observatory, he participated in the development of HARPS, the current state-of-the-art planet finding machine. He also continues to carry out a vigorous program of theoretical research focusing on the origin and evolution of planetary systems in general and the solar system in particular.

In recent years, he has also been serving on several science advisory committees. On a national level, he is a member of the Swiss Science and Technology Council, the country's highest-ranking science advisory body. He has served on the European Space Agency (ESA) Space Science Advisory Committee, and is currently an active member of the European Southern Observatory (ESO) Science and Technological Committee and of the European Space Science Committee of the European Science Foundation (ESF).



### Giovanni Bignami

Professor of Astronomy and Astrophysics University of Pavia, Italy  
 Director Centre d'Etude Spatiale des Rayonnements, Toulouse, France

Giovanni Fabrizio Bignami (born near Milan, 1944) contributed to the planning, design, realization or scientific exploitation of almost all the major space science missions in astronomy and high-energy astrophysics, starting with ESRO's TD-1 (1972) after his degree in Beppo Occhialini's group (Milan, 1968) and continuing with ESA's COS-B (1975).

Covering fields from physics to instrumentation to galactic and extragalactic astronomy, he has authored or co-authored more than three hundred professional papers, pioneering the search for new celestial objects using all astronomical channels, from ground and from space. He has taken an active part in the XMM/Newton mission, where he was P.I. from 1988 to 1998.

GFB frequently concentrated on neutron stars, most recently proposing them as a celestial laboratory for new physics.

For his discovery of "Geminga" he was awarded, together with J. Halpern, the 1993 "Bruno Rossi" Prize of the American Astronomical Society.

A professor of Astronomy at the University of Pavia, GFB is a member of the Accademia dei Lincei, of the Accademia Europaea, of the International Astronautics Academy and has been made "Officer de l'Ordre National du Merit" of France. The Royal Society and COSPAR gave to GFB the 2002 Massey Award for space science, with J. Paul. In 2004 the Italian Ministry of Culture awarded to GFB its five-yearly Astronomy Prize.

From 1997 to 2002 GFB has served as Director of Science at the Italian Space Agency and has represented Italy at ESA's Science Policy Committee.

Currently, GFB is Director of the Centre d'Etude Spatiale des Rayonnements in Toulouse (France) and serves on CNES science advisory bodies.

He now chairs ESA's Space Science Advisory Committee and for ESA GFB coordinated the Cosmic Vision 2015-2025 space science plan.

GFB is a contributor to Nature and Science on a variety of topics, including history of science and scientists. A strong believer in presenting science to a wide audience, he also contributes to Italian, French and US magazines and Encyclopaedias, and has participated to TV series (for RAI and for ESA/Euronews). He has authored two space science documentaries, "Project 242" on human exploration of Mars, and "Bravo! BeppoSAX" on the Italian Space Agency mission dedicated to his mentor, G. Occhialini. The first biography of this great Italian scientist was written by GFB for the Memoirs of the Royal Society.

His recent books include "La storia nello spazio", now in press by O. Jacob, Paris, and, as a keen student of languages, "Against the Donning of the Gown" (Unaluna, Milan, 2000). The latter is the first translation into English of a 301-line poem by Galileo Galilei, written circa 1590. The version by GFB is written in iambic pentameters, bound in Galileo's original structure of Dantesque tercets.



## Edoardo Boncinelli

Professor of Biology and Genetics, Vita-Salute University, Milan, Italy

Edoardo Boncinelli is full professor of Biology and Genetics at the university Vita-Salute in Milan. He has been Director of SISSA-ISAS International School for Advanced Studies in Trieste and Head of the Laboratory of Molecular Biology of Development at the Scientific Institute San Raffaele in Milan.

A physicist by training, he worked in the field of genetics and molecular biology of higher animals and man, first in Naples, at the International Institute of Genetics and Biophysics (IIGB) of CNR, where he progressed through most of his scientific career, and subsequently in Milan. He is a member of Academia Europaea and EMBO, the European Molecular Biology Organisation, and a past-president of the Italian Society of Biophysics and Molecular Biology.

In 2005 he received the EMBO Award for Communication in the Life Sciences.

His research interests, all revolving around embryonic development of Vertebrates, range from the very early determination of body axis to the formation and subdivision of the cerebral cortex. His personal interests have progressively drifted toward the study of higher mental functions. He wrote some popular books on biology: "A caccia di geni" (Di Renzo Editore), "I nostri geni" (Einaudi) and "Il cervello, la mente e l'anima" (Mondadori). In 2000 he wrote "Le Forme della Vita" (Einaudi), and three debate-books with Umberto Galimberti (Einaudi), Aldo Carotenuto (Bompiani) and Umberto Bottazzini (Cortina).

In 2001 he published "Prima lezione di biologia" (Laterza) and "Genoma: Il grande libro dell'uomo" (Mondadori); in 2002 "Io sono tu sei" (Mondadori); nel 2003 "Tempo delle cose, tempo della vita, tempo dell'anima" (Laterza); in 2004 "Il posto della scienza" (Mondadori). In 2005 he published "Verso l'immortalita'?" (Cortina) with Galeazzo Sciarretta, "Sani per scelta" (Corriere della Sera) and "Prodigi quotidiani" (Boroli). Currently a columnist for Le Scienze, the Italian edition of Scientific American, and Il Corriere della Sera.

Edoardo Boncinelli has significantly contributed to our understanding of biological mechanisms of embryonic development in higher animals and man. In 1985, he was among the first to grasp the significance of the novel discoveries on the genetic control of drosophila development and to try and apply them to the study of human beings. His group identified and characterised a gene family, the 39 HOX homeogenes, controlling the correct development of the trunk, from neck to tail. These findings are recognised as landmarks of the biology of this time, if not of everytime.

From 1991, he undertook the study of the developing brain and cerebral cortex, identifying a couple of additional homeogene families playing a major role in the underlying processes, in health and disease.

**Massimiano Bucchi**

Professor of Sociology of Science and Sociology of Communication,  
University of Trento, Italy

Massimiano Bucchi (Ph.D. European University Institute, 1997) is Professor of Sociology of Science at the University of Trento, Italy. He has published six books, including *Science and the media* (London and New York, Routledge, 1998) and *Science in society. An Introduction to Social Studies of Science* (London and New York, Routledge, 2004) and several essays in international journals such as *Nature*, *Science*, *History and Philosophy of the Life Sciences*,

*New Genetics and Society*, and *Public Understanding of Science*.

He is a member of the International Scientific Committee for Public Communication of Science and Technology and has served as advisor for several international research and policy bodies, including the Royal Society, the US National Science Foundation and the European Commission.

He has carried out research and given seminars at several international institutions, such as the Royal Society Universität Bielefeld, ETH Zurich, London School of Economics, University of California Berkeley, Royal Swedish Academy of Sciences, University of Tokyo and received several recognitions for his work, including the Mullins Prize awarded by the Society for Social Studies of Science and the Lelli prize for the best dissertation in sociology.



### **Luigi Luca Cavalli Sforza**

Professor of Human Genetics, Stanford University, CA, USA

Luigi Luca Cavalli-Sforza, M.D.Pavia 1944, has worked on sex in bacteria and the origin of resistance to antibiotics, and beginning in the early fifties started research in human population genetics and evolution, showing the major role of random genetic drift, and the help the understanding of this evolutionary factor gives to the reconstruction of the evolutionary origin of human populations, using genetic data of a great variety of types, from blood groups to

proteins and DNA (including mitochondria and of the Y chromosome, as well as microsatellites) which all gave coherent conclusions.

He also introduced in the investigation of human evolution multi-disciplinary approaches, including linguistics, and showed the correctness of a statement by Darwin in his Origin of Species, that "if we possessed a perfect pedigree of mankind, a genealogical arrangement of the races of man would afford the best classification of all languages now spoken throughout the world".



**Gilberto Corbellini**

Professor of History of Medicine and Bioethics, La Sapienza University, Rome, Italy

Professor of History of Medicine and Bioethics at the Medical Faculty of the University of Rome "La Sapienza" and co-editor of "Darwin" (Italian bimonthly of scientific culture).

He has studied and written on several aspects of the historical, epistemological and ethical development of biomedical sciences in the XX century.



### **Antonio Damasio**

David Dornsife Professor of Neuroscience; Director, Brain and Creativity Institute, University of Southern California, USA

Antonio Damasio is David Dornsife Professor of Neuroscience and Director of the Brain and Creativity Institute at the University of Southern California; he is also an adjunct professor at the Salk Institute in La Jolla, California.

Until 2005 he was at the University of Iowa as Van Allen Distinguished Professor and Head of the Department of Neurology.

Damasio's books, "Descartes' Error", "The Feeling of What Happens", and "Looking for Spinoza" are translated into over 30 languages and taught in universities worldwide.

He is also the recipient of numerous awards (including, most recently, the Asturias Prize in Science and Technology, 2005; and the Signoret Prize, 2004, which he shared with his wife Hanna Damasio). Damasio is a member of the Institute of Medicine of the National Academy of Sciences and a fellow of the American Academy of Arts and Sciences, the Bavarian Academy of Sciences, and the European Academy of Sciences and Arts. He has been named "Highly Cited Researcher" by the Institute for Scientific Information.

His research focus is the neurobiology of the mind, specifically the understanding of the neural systems that sub serve memory, language, emotion, and decision-making; his clinical interests focus on disorders of behavior and cognition, and movement disorders.



### **Paolo de Bernardis**

Professor of Astronomy and Astrophysics,  
La Sapienza University, Rome, Italy

Born in Firenze, 01/Feb/1959. Physics degree (Laurea) in 1982 at Università' di Roma La Sapienza (summa cum laude). Ph.D. in 1987. Researcher in 1984. Associate Professor in 1992. Full Professor at Università' di Roma La Sapienza (Nov.2001-now). Author or co-author of more than 100 papers on international journals with referees, including a few renowned papers.

The field of activity is Experimental Astrophysics and Cosmology, with focus on the Cosmic Microwave Background (CMB). Italian PI of the stratospheric balloon experiment BOOMERanG/B2K on the anisotropy and polarization of the Cosmic Microwave Background.

In the Antarctic flight of 1998 BOOMERanG has detected for the first time acoustic oscillations in the primeval plasma, and demonstrated the flatness of the Universe. For these results he has been awarded the Premio Feltrinelli of the Accademia dei Lincei in 2001. In 2003 BOOMERanG/B03 has detected the polarization of the CMB.

Has been co-investigator of the international experiments Archeops and MAXIMA on the CMB; Co-investigator of the High Frequency Instrument of the Planck Satellite of the European Space Agency, and in charge for the cryogenic preamplifiers of all the Planck-HFI detectors. Member of the Astronomy Working Group of the European Space Agency (2002-2004). Has served as a referee for the Astrophysical Journal, Astronomy and Astrophysics, and Nature; he is one of the editors of the Journal of Cosmology and Astroparticle Physics and of the Memorie della Societa' Astronomica Italiana.

Teaches the classes of Experimental Astrophysics and of Cosmology for the Physics degree; Astrophysics and Experimental Astrophysics for the Physics and Astrophysics degree. He has been advisor for 30 Physics degree "laurea" thesis and 5 Ph.D. thesis.



## Daniel Dennett

University Professor and Austin B. Fletcher Professor of Philosophy,  
Director Center for Cognitive Studies, Tufts University, Medford, MA, USA

Daniel C. Dennett, the author of *Breaking the Spell* (Viking, 2006), *Freedom Evolves* (Viking Penguin, 2003) and *Darwin's Dangerous Idea* (Simon & Schuster, 1995), is University Professor and Austin B. Fletcher Professor of, and Co-Director of the Center for Cognitive Studies at Tufts University.

He lives with his wife in North Andover, Massachusetts, and has a daughter, a son, and a grandson. He was born in Boston in 1942, the son of a historian by the same name, and received his B.A. in philosophy from Harvard in 1963.

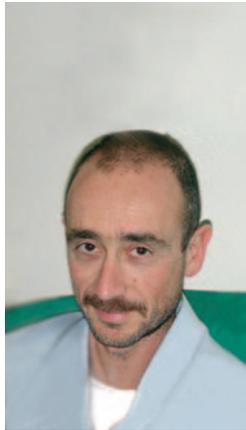
He then went to Oxford to work with Gilbert Ryle, under whose supervision he completed the D.Phil. in philosophy in 1965. He taught at U.C. Irvine from 1965 to 1971, when he moved to Tufts, where he has taught ever since, aside from periods visiting at Harvard, Pittsburgh, Oxford, and the Ecole Normal Superieure in Paris.

His first book, *Content and Consciousness*, appeared in 1969, followed by *Brainstorms* (1978), *Elbow Room* (1984), *The Intentional Stance* (1987), *Consciousness Explained* (1991), *Darwin's Dangerous Idea* (1995), *Kinds of Minds* (1996), and *Brainchildren: A Collection of Essays 1984-1996* (MIT Press and Penguin, 1998). He co-edited *The Mind's I* with Douglas Hofstadter in 1981. He is the author of over three hundred scholarly articles on various aspects on the mind, published in journals ranging from *Artificial Intelligence and Behavioral and Brain Sciences* to *Poetics Today* and the *Journal of Aesthetics and Art Criticism*.

He gave the John Locke Lectures at Oxford in 1983, the Gavin David Young Lectures at Adelaide, Australia, in 1985, and the Tanner Lecture at Michigan in 1986, among many others. He has received two Guggenheim Fellowships, a Fulbright Fellowship, and a Fellowship at the Center for Advanced Studies in Behavioral Science. He was elected to the American Academy of Arts and Sciences in 1987.

He was the Co-founder (in 1985) and Co-director of the Curricular Software Studio at Tufts, and has helped to design museum exhibits on computers for the Smithsonian Institution, the Museum of Science in Boston, and the Computer Museum in Boston.

He spends most of his summers on his farm in Maine, where he harvests blueberries, hay and timber, and makes Normandy cider wine, when he is not sailing. He is also a sculptor.

**Denis Duboule**

Professor of Zoology and Animal Biology, Geneva University,  
Director NCCR 'Frontiers in Genetics', Geneva, Switzerland

Denis Duboule was born in Geneva, Switzerland in 1955. Educated in biology at the University of Geneva, he worked at the medical school in Strasbourg and at the EMBL, Germany, before becoming Professor of Developmental Biology.

He is currently Chairman of the Department of Zoology and Animal Biology in Geneva, and Director of the National Center of Excellence "Frontiers in Genetics".

He is member of several societies, organizations and academies. He is editor of the journal *Development* and has received several national and international prizes, amongst which the Louis-Jeantet prize for Medicine (1998), the Marcel Benoist prize (2003) and the Grand Prix de Biologie Ch.-Léopold Mayer from the French Academy of Sciences (2004). He is actively involved in the communication of science through numerous TV and radio programmes as well as chronicles in newspapers.

Duboule's scientific contributions are in the field of developmental genetics and evolution, in particular the study of the function and regulation of genes involved in vertebrate body patterning. For many years, he has been interested in understanding the molecular mechanisms underlying specific temporal processes at work during development.

He has demonstrated the essential role of genes in the formation of limbs and the urogenital system. He is also interested in technological development regarding mouse molecular genetics and genomics approach to developmental problems.



### **Irenäus Eibl-Eibesfeldt**

Professor, Humanethologische Filmarchiv, Max-Planck Gesellschaft and Humanwissenschaftliches Zentrum der Ludwig-Maximilian Universität München, Germany

Prof. Dr. I. Eibl-Eibesfeldt, born in Vienna, June 15, 1928, Austria. 1945-1949 study at University of Vienna (Zoology). Promotion Dr. phil. December 1949. 1946-1948 research associate at the Biological Station Wilhelminenberg near Vienna.

1949 research associate of the Institute for Comparative Behavior Studies in Altenberg near Vienna (Head: Prof. Konrad Lorenz). 1951-1969 Max-Planck-Institute for Behavioral Physiology (first in Westphalia, from 1957 at Seewiesen, Bavaria); 1960 guest Professor for one term at the University of Chicago and 1966 at the University of Minnesota. 1963 habilitation at the University of Munich. 1970 Prof. of Zoology at the University of Munich. Since 1970 Head of a Research Group for Human Ethology which became an independent Research Institute for Human Ethology of the Max-Planck-Society in 1975, first in Seewiesen and now in Andechs. 1957-1970 Honorary Scientific Director of the International Institute for Submarine Research in Vaduz.

Since 1992 Honorary Director of the Ludwig-Boltzmann-Institute for Urban Ethology in Vienna. The first 20 years of his scientific career (1946-1966) were devoted to comparative vertebrate ethology focusing on communicative behaviors and the study of ontogeny, in particular of mammals. Diving expeditions (Xarifa Expeditions, lead by Prof. Hans Hass) 1953/54 Caribbean Sea (Galapagos) and 1958 Maldives, Nicobares.

1957 Head of the UNESCO expedition to the Galapagos Islands. 1967 first textbook on Ethology. "From the midsixties studies on Human Ethology". Studies of the expressive behaviors of deaf and blind born, and start of cross-cultural documentation of human behavior.

Through these studies he established the discipline of Human Ethology. Foundation of the Ludwig-Boltzmann-Institute of Urban Ethology in 1992. Director of this institute. Numerous anthropological expeditions to document in longitudinal studies the everyday life and rituals of the Yanomami (Waika-Indians Upper Orinoko, South America), Hima (Namibia), Kalahari Bushmen (Kung, G/wi, Ko, Botswana), Eipo (West-Irian, New Guinea), Biama (Papua New Guinea), Bali and Trobriand Islanders.



### Marco Ferraguti

Professor of Biological Evolution, University of Milan, Italy

Marco Ferraguti (Milano, 1947) is Professor of Biological Evolution for the Courses in Biological and Natural Sciences of the Università degli Studi of Milan.

He works at the Department of Biology of the same University. His research interests are among Zoology, Cytology, Ultrastructure and Evolution. He has worked mainly on new models of invertebrate spermatozoa from different phyla (Cnidaria, Platyhelminthes, Aschelminthes, Annelida, Arthropoda) with various microscopical techniques.

Aschelminthes, Annelida, Arthropoda) with various microscopical techniques.

Invertebrate spermatozoa are highly species-specific, and often exceedingly complex cells. From one side he has studied the complex mechanisms guiding the genesis of those forms, and from another he has widely used sperm characters for phylogenetic analyses of various phyla (Annelida, Gastrotricha), thus approaching different computer-assisted techniques of phylogenetic reconstructions. His main finding concerns the first description of a double sperm line (thus of a double spermatogenesis) in Annelida Tubificinae. The presence of divergent formation of the two sperm types and their functional role have been clarified in many different species of the group. He is the author of about seventy papers and book chapters.

As a teacher he is deeply involved in the divulgation of evolutionary themes, both in his official courses, and in seminars for PhD students in different Universities (Milano, Modena, Trieste, Urbino). He is also a teacher and tutor for the Doctorate School in Animal Biology at the Università degli Studi di Milano and for the PhD Program in Foundations Of the Life Sciences And Their Ethical Consequences of the European School of Molecular Medicine.

He likes books, in many different senses: he is the Director of the Biological Library of the Università degli Studi di Milano and a member of the Board of the Libraries of the same University; he is a translator: he has worked, among others, on texts by S.J. Gould, N. Eldredge, E. Mayr. He is the Editor of the Italian translation of Evolution by Mark Ridley for McGraw-Hill Italia.

He is one of the Editors of the Journals Zoomorphology and Systema Naturae.

He likes cycling, skiing, walking on the mountains, reading novels, and listening to classical music, in particular of the eighteenth century.



### **Tecumseh Fitch**

School of Psychology, University of St. Andrews, Scotland, UK

Tecumseh Fitch studies the evolution of cognition and communication in animals and man, focusing on the evolution of speech, music and language.

He is interested in all aspects of vocal communication in terrestrial vertebrates, particularly vertebrate vocal production in relation to the evolution of speech and music in our own species.

Originally trained in animal behaviour and evolutionary biology, he studied speech science and cognitive neuroscience as a graduate student at Brown University (PhD 1994).

A post-doc in speech science at MIT followed, where he applied the principles of human vocal production to other animals (including alligators, deer, birds, seals and monkeys). Fitch then taught at Harvard from 1999-2002, first in Biology and then Psychology.

In 2002 he was a visiting fellow at the European Institute for Advanced Studies, in Berlin, and in 2003 he took a permanent position at the University of St Andrews in Scotland, where he continues his research on humans and various vertebrates in the School of Psychology (Centre for Social Learning and Cognitive Evolution).

Fitch recently served as Leibniz Professor at Leipzig University, where also worked at the Max Planck Institute for Evolutionary Anthropology in Svante Paabo's group.

For fun he composes music, plays Frisbee, and paints.



### **Michael Gazzaniga**

Director Sage Center for the Study of Mind, Uni. of California,  
Santa Barbara, CA, USA

Dr. Michael Gazzaniga received his A.B. from Dartmouth College. He then attended the California Institute of Technology, where he received his Ph.D. in Psychobiology.

Here he worked under the guidance of Roger Sperry, with primary responsibility for initiating human split-brain research—research that won Sperry the Nobel Prize.

After stints in various academic settings from California to New York, Dr. Gazzaniga became the Andrew W. Thompson, Jr. Professor of Psychiatry and Director of the Program in Cognitive Neurosciences at Dartmouth Medical School.

In 1992 he became the Director of the Center for Neuroscience at the University of California - Davis. In 1996, Dr. Gazzaniga's alma mater called him back to help them lead a new program in the mind sciences. Until recently, he was, the David. T. McLaughlin Distinguished University Professor at Dartmouth College and the Director of the Center for Cognitive Neuroscience. Most recently has returned to California to become the first director of the Sage Center for the Study of Mind at the University of California, Santa Barbara.

Through his extensive work with split-brain patients, Dr. Gazzaniga has made important advances in our understanding of functional lateralization in the human brain and of how the cerebral hemispheres communicate with one another. His research is well known not only in clinical and basic science circles, but to the lay public as well. He captured the main features of this work in his widely acclaimed book, *The Social Brain*, 1985 (Basic Books).

His book, *Mind Matters*, 1988 (Houghton Mifflin) served as an introduction to problems in mental disorders. In 1992 he published *Nature's Mind* (Basic Books) which the *New York Times* said "would do for brain research what Stephen Hawking had done for cosmology." His landmark 1995 book for MIT Press, *The Cognitive Neurosciences*, featured the work of 92 scientists. It is now recognized as the sourcebook for the field, and is in its third edition. He has just published another book, *The Ethical Brain*.

Dr. Gazzaniga is the president of The Cognitive Neuroscience Institute, which he founded in 1982, and is the Editor-in-Chief emeritus of the *Journal of Cognitive Neuroscience*, which he also founded. In 1997, Dr. Gazzaniga was elected to the American Academy of Arts & Sciences. He also has been elected President of the American Psychological Society. He also serves on the President's Council on Bioethics and in 2005 he was elected to the National Academies Institute of Medicine.



## Giulio Giorello

Professor of Philosophy of Science, University of Milan, Italy

Giulio Giorello was born in Milan in 1945.

After a period of training in research funded by a grant from the Italian National Research Council Research (Logic and Mathematics section), he took up teaching positions in the Faculty of Engineering of the University of Pavia, Faculty of Philosophy and Humanities of the University of Milan, and the Science Faculty of the University of Catania, where he was appointed full professor of the foundations

of mathematics. In 1978 he became full professor of Philosophy of Science at the University of Milan and remains in that position.

Professor Giorello is member of the editorial board of several journals, including *Rivista di Storia della Scienza*, *Prometeo*, and *Nuova Civiltà delle Macchine*.

In September 2000 the President of Italy Carlo Ciampi honoured him with the title "Benemerito della scienza e della cultura". Since 2002 he has been president of the Italian Society of Logic and the Philosophy of Science.

Professor Giorello has published several books, including (with S. Morini), *Parabole e catastrofi, Intervista a René Thom su matematica, scienza e filosofia* (Milano 1980, translated into French, Portuguese and Polish); *Filosofia della scienza* (Milano, 1992); *La filosofia della scienza nel XX secolo* (with D. Gillies; Roma-Bari 1995); *Prometeo, Ulisse, Gilgame. Figure del mito* (Milano 2004); *Di nessuna chiesa. La libertà del laico* (Milano 2005).



### **Margherita Hack**

Professor of Astronomy and Astrophysics, University of Trieste, Italy

Born in Firenze (June 12, 1922), PhD in Physics January 1945, discussing a thesis in Astrophysics, 1945-1951 assistant professor in astronomy at Firenze University, 1952-1954 astronomer at the Astrophysical Observatory of Arcetri in Firenze, 1954 docent of Astrophysics, 1954-1964 astronomer at the Brera Astronomical Observatory in Milano, 1964-1997 Full Professor of Astronomy at Trieste University, 1964-1987 Director of the Trieste Astronomical

Observatory, 1986-1992 Director of the Astronomy Department of the Trieste University. Now Professor Emeritus of the Trieste University.

Since 1978 member of the "Accademia Nazionale dei Lincei".

Member of the International Astronomical Union, of the Società Astronomica Italiana, of the Società Italiana di Fisica, of the European Physics Society, of the Royal Astronomical Society.

Visiting researcher at the University of Berkeley, California, of Princeton New Jersey, at the Institute for Advanced Study, Princeton, New Jersey, Utrecht University, Groningen University, Institut d'Astrophysique, Paris. Visiting Professor at the Universidad Autonoma de Mexico, at the Ankara University.

M.H. has published more than 250 scientific papers on international journals, about 10 books for university students and about 20 popular books of astrophysics.

Her main fields of research is stellar structure and evolution with special concern for chemical peculiar stars and interacting binaries.

In the forties she has been Italian university champion of high and long jumps.



## **Günther Hasinger**

Astrophysicist, Director Max-Planck Institute for Extraterrestrial Physics, Garching, Germany

Günther Hasinger is one of the world's leading researchers in the field of X-ray astronomy. In 2002 he and his team became the first to prove the impending merger of two supermassive black holes in a distant galaxy.

For the past few years Günther Hasinger has been working on studying the X-ray background. His research has helped to prove that this diffuse faint glow of X-rays comes essentially from many individual celestial objects.

His research on the formation of galaxies has contributed decisively to massive black holes in the centre of galaxies being regarded as the seeds for their formation, rather than the product of their development. Günther Hasinger is currently involved in studying the cores of active galaxies as well as being involved in the hunt for dark matter.

As part of this work he is actively involved in the development of X-ray telescope satellites, which it is hoped will provide answers to various questions on the distribution of matter and the early development of stars and galaxies.

Günther Hasinger studied physics at the Ludwig Maximilians University of Munich and completed his doctorate in astronomy there in 1984.

Following his qualification as a professor in 1995 he was first appointed as a professor at the University of Potsdam, where he was also director of the Astrophysical Institute. Since 2001 he has been the director of the Max Planck Institute for Extraterrestrial Physics in Garching.

His successful work has been decorated by many awards. So he was a visiting astronomer in Caltech in 1992, Princeton Spring Lecturer in 1993, in 2000 Marker Lecturer at the Penn State University, in 2002 he became a member of the Berlin-Brandenburg Academy of Science and in 2003 Honorary Professor at the Technical University Munich.

In 2005 he received the Gottfried Wilhelm Leibniz Prize, the highest honour awarded in German research.

**Marc Hauser**

Professor of Psychology, Organismic & Evolutionary Biology and Biological Anthropology, Harvard University, Cambridge, MA, USA

Marc Hauser's research sits at the interface between evolutionary biology and cognitive neuroscience and is aimed at understanding how the minds of human and nonhuman animals evolved.

By studying monkeys and apes in both the wild and in captivity, as well as human infants and adults, Hauser's work has unlocked some of the mysteries of language evolution, conceptual representation, social cooperation, communication, and morality.

He is a Harvard College Professor, Professor in the Departments of Psychology, Organismic & Evolutionary Biology, and Biological Anthropology, Co-Director of the Mind, Brain and Behavior Program, Director of the Primate Cognitive Neuroscience Laboratory, and the author of more than 200 papers and five books, including "The Evolution of Communication" (1996, MIT), "Wild Minds" (2000, Holt), and the forthcoming "Moral Minds: The unconscious voice of right and wrong" (Harper Collins).

He is currently working on a book about the mind with Noam Chomsky.



### **Kathleen Kennedy Townsend**

Professor Georgetown University's School of Public Policy,  
Visiting Fellow Kennedy School of Government, Harvard,  
Cambridge, MA, USA

Adjunct Professor at Georgetown University's School of Public Policy and Visiting Fellow at the Kennedy School of Government at Harvard. She is a consult for US and international corporations.

Kathleen Kennedy Townsend has a long history of service in the public arena. As Maryland's first woman Lieutenant Governor, she was had a multimillion dollar budget and had oversight of major departments including the State Police, Economic Development, Transportation, and the Office of Children Youth and Families. She is known nationally for her innovative and results oriented programs such as Hot Spots, Break the Cycle, the development of Maryland's bio-tech business, the launching of the e-readiness initiative and the establishment of one of the first state wide offices of character education.

Before being elected Lt. Governor, Mrs. Townsend served as Deputy Assistant Attorney General of the United States. In that role, she led the planning to put 100,000 police officers into the community and she ignited the Police Corps, a program to give college scholarships to young people who pledge to work as police officers for four years after graduating.

Prior to serving at the Department of Justice, Mrs. Townsend spent seven years as the founder and director of the Maryland Student Service Alliance. It was in this role that she led the fight to make Maryland the first state in the nation to require all high school students to perform community service. Before launching that initiative, she worked as an environmental attorney both in private practice and as an Assistant Attorney General in Maryland. In addition, in 1982 she managed Senator Edward Kennedy's successful re-election campaign.

Mrs. Townsend has taught foreign policy at the University of Pennsylvania and the University of Maryland, Baltimore County. She has published articles in the New York Times, Washington Post, and Washington Monthly, among others. In the mid 1980s she founded the Robert F. Kennedy Human Rights Award - whose recipients now include the Comadres of El Salvador, Adam Michnic of Poland, and Beyers Naude of South Africa.

Mrs. Townsend is Chair of the Institute for Human Virology at the University of Maryland and currently serves on the boards of directors of the John F. Kennedy Library Foundation, Points of Light Foundations, Strategic Partnerships, the Institute for Women's Policy Research, the Character Education Partnership and she is a member of the Council of Foreign Relations and the Inter-American Dialogue. She previously served on the boards of the Export-Import Bank, Johns Hopkins School of Advanced International Studies, the Wilderness Society, the Baltimore Urban League and was chair of the Robert Kennedy Memorial. An honours graduate of Harvard University, she received her law degree from the University of New Mexico where she was a member of the law review. She has received ten honorary degrees.



### **Maurizio Martelli**

Professor of Informatics, Dean Faculty of Sciences MFN, University of Genoa, Italy

Graduated with honors in Computer Science at the Univ. of Pisa in 1974, in 1976 he joined CNUCE, an Institute of the Italian National Research Council (CNR), as a Researcher. He is Full Professor of Computer Science and Artificial Intelligence in the University of Genova since November 1990.

He has been elected Dean of the Faculty of Science and member of the Academic Senate of the University of Genova, he is also Secretary of the Italian Deans of Science Conference.

He is President of the Advisory Board of the ISICT (an Institute for advanced studies in ICT with strong relationship with industries), member of the Scientific Council of the "Integrated Intelligent Systems Technological District" of Liguria, member of the Executive Committee of the Association for the Science Festival of Genova.

He has coordinated research groups since 1979 and has participated to projects of the European Community, notably, he was a senior investigator of the ESPRIT BRA project 'Integration' which has to study the integration of the foundations of Logic, Functional and Object-Oriented programming. In 1985-86 was visiting scientist for one year at the University of Syracuse (NY) for a collaboration with Prof. A. Robinson.

He has organized various events such as the first Advanced School on Foundations of Logic Programming (Alghero, 1988), the third meeting of the Italian Association of Artificial Intelligence (Genova, 1992), he was general chairman for the 'International Conference on Logic Programming' (Genova, 1994) and member of the editorial board of the European Journal on Artificial Intelligence. He served as member of the Executive Committee of ALP (the world wide Association for Logic Programming) and as President of GULP (Italian section of ALP).

At the beginning of his career he has been active in computer networks and distributed systems; since 1980 his research is mostly in the area of Logic Programming, in particular: the integration of logic, functional and object-oriented programming, the problem of negation in logic programming, the semantics of programming languages, the integration of logic programming and deductive databases and the study of extensions of logic programming to higher order logic.

Lately, his research interests include from the theoretical point of view the use of Higher Order Linear Logic in Logic Programming and from the applicative point of view the use of LP techniques in the specification and rapid prototyping of Intelligent Multi-Agent Systems, Ontologies and Software Engineering.



## **Luc Montagnier**

World Foundation for Aids Research and Prevention President

Luc Montagnier has spent most of his scientific carrier in the study of viruses associated with chronic diseases.

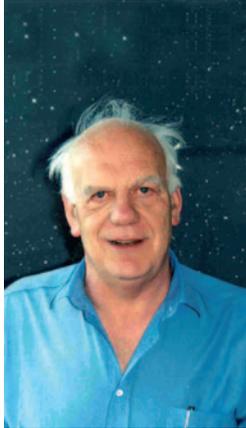
Among his achievements are the isolation, with his French team, of the viruses known as HIV1 and HIV2, the first description of the apoptotic state of lymphocytes from patients with AIDS and seminal observations on the role of infectious cofactors in the disease.

Besides his involvement in the design of new types of protective and therapeutic AIDS vaccines, his current studies are aimed at the diagnosis and treatment of microbial and viral factors associated with cancers, neuro-degenerative and auto-immune diseases.

As a strong advocate of preventive medicine, he is especially concerned with prolonging the active life of aging people.

Beyond his scientific interest in his deep involvement with helping developing countries acquire knowledge of and access to modern medicine and preventive medicine.

As President of the World Foundation for Aids Research and Prevention, he has co-founded a center for the treatment, research and diagnosis of AIDS patients in the Ivory Coast, as well as supervising the creation of similar centers in other parts of Africa.



### **Franco Pacini**

Professor of Astronomy and Astrophysics University of Florence,  
Astronomical Observatory, Arcetri, Florence, Italy

Franco Pacini is currently Professor of Astrophysics at the University of Florence. Upon completion of high school education in Urbino, he studied physics in Pisa and Rome, where he graduated in 1964.

In his career he spent long periods abroad (Institut d'Astrophysique in Paris; Cornell University in Ithaca, New York) and devoted his research mostly to high energy astrophysics. In 1967 he published the first specific suggestion that strongly magnetized neutron stars could release their rotational energy and produce a large flow of relativistic particles. The discovery of pulsars in Cambridge (UK) proved the correctness of his hypothesis just a few months later.

On a different topic, after the discovery of the strong infrared emission from some galaxies, Pacini, together with Martin Harvit, put forward the suggestion that these sources are related to an intense burst of formation of massive stars, a scenario which is now generally accepted.

In 1975 Pacini joined the newly created scientific group of the European Southern Observatory in Geneva but a strong attraction toward the hills of central Italy led him to return to his country in 1978, when he became Director of the Arcetri Astrophysical Observatory in Florence. He held this post until 2001. During his tenure the Observatory greatly expanded its scientific activity in different areas, in a broad context of international collaborations. In particular, during this period Arcetri became partner in the construction of the Large Binocular Telescope (LBT), the largest optical-infrared telescope in the northern hemisphere (with 2 mirrors, each with a diameter 8.4 meters).

Prof. Pacini has been/is member of a large number of international boards and committees. He was President of the International Astronomical Union for a 3-year period (2001-03). He is Member of the Accademia Nazionale dei Lincei, Associate Member of the Royal Astronomical Society and Member of the American Astronomical Society.

He has received the Prize of the Italian Government for Science. Over the years he has carried out a wide range of activities aimed at communicating Science to the general public (children and adults), with frequent public lectures, popular articles in newspapers, books, appearances on television.





### Telmo Pievani

Professor of Philosophy of Science, University of Milan II Bicocca, Italy

Born in Gazzaniga (Bergamo, Italy, 1970), graduated in Philosophy of Science at the State University of Milan with Professor Giulio Giorello, researcher in the field of Philosophy of Biology and Theory of Evolution, after doctoral researches in USA under the supervision of Niles Eldredge and Ian Tattersall at the American Museum of Natural History in New York, he is now Associate Professor in Philosophy of Science at the University of Milan II Bicocca.

The Ph.D. thesis was about the scientific work of Stephen J. Gould. His first monograph about paleoanthropology, "Homo sapiens and Other Catastrophes" (Meltemi, Rome, 2002), reached the third edition in few months. He is author of "Introduction to Philosophy of Biology" (Laterza, Roma-Bari, 2005) and "The Theory of Evolution" (Il Mulino, Bologna, 2006).

He is the founder of a permanent Workshop in Philosophy of Biology at the University of Milan II Bicocca. He is the Scientific Coordinator of the Genoa Science Festival. Member of the Scientific Board of Darwin Day Celebrations at the Natural History Museum of Milan, he is Director of "Pikaia", the first Italian website dedicated to evolution and philosophy of biology.

Editor of issue n.8 (History of Science and Technology) of the "Storia della Cultura Italiana" directed by professor Luca Luigi Cavalli Sforza for UTET-Grandi Opere, he is fellow of the International Research Group on Evolutionary Hierarchy Theory founded by Niles Eldredge (American Museum of Natural History of New York).

He is the editor of the Italian edition of Stephen J. Gould's "The Structure of Evolutionary Theory" (Codice Edizioni, Torino, 2003), but also of Richard Dawkins, Niles Eldredge, Stuart Kauffman, Ian Tattersall, Susan Oyama, Kim Sterelny and Edward O. Wilson's books. Since 1994, he is member of the Italian National Association of Journalists, with contributions to national newspaper like La Repubblica, Micromega and L'Indice dei Libri del Mese.



### **Steven Pinker**

Johnstone Family Professor, Department of Psychology, Harvard University, Cambridge, MA USA

Steven Pinker, a native of Montreal, received his BA from McGill University in 1976 and his PhD in psychology from Harvard in 1979. After serving on the faculties of Harvard and Stanford Universities for a year each, he moved to MIT in 1982, where he spent 21 years before returning to Harvard in 2003 as the Johnstone Family Professor of Psychology.

Professor Pinker's research has focused on visual cognition and the psychology of language. The research has been reported in two technical books and many journal articles, and won the Troland Award from the National Academy of Sciences, the Henry Dale Prize from the Royal Institution of Great Britain, and the Early Career Award and McCandless Prize from the American Psychological Association.

Pinker has also received awards for graduate and undergraduate teaching, two prizes for general achievement, three honorary doctorates, and eight awards for his critically acclaimed popular science books *The Language Instinct*, *How the Mind Works*, and *The Blank Slate*; the latter two were also finalists for the Pulitzer Prize in Nonfiction.

Pinker is an elected fellow of several scholarly societies, including the American Academy of Arts and Sciences, the American Association for the Advancement of Science, and the Neuroscience Research Program.

He is an associate editor of *Cognition* and serves on many professional panels, such as the Usage Panel of the American Heritage Dictionary, the Scientific Advisory Panel of the Evolution series on NOVA, and the Endangered Language Fund.

Professor Pinker also writes in the popular press, including *The New York Times*, *Time*, *The New Yorker*, and *Technology Review*.



### Luigi Piro

Astrophysicist, Director of Research, Istituto Astrofisica Spaziale Fisica Cosmica, INAF, Rome, Italy

Born in Rome, April 3, 1960. Graduated cum laude in Physics at Rome University La Sapienza in 1983.

In 1985 research staff position at Istituto Tecnologie e Studio Radiazioni Extraterrestri of C.N.R., Bologna. In 1988 he moved to Japan, in RIKEN, where he co-led the discovery, with the Japanese X-ray Astronomy satellite named GINGA, of the fuelling mechanisms

powering a massive black-hole in the center of distant galaxies. Coming back to Italy in 1990, he moved to Istituto Astrofisica Spaziale, C.N.R., in Rome. He was appointed Project Scientist of the BeppoSAX satellite by the Italian Space Agency (ASI) in 1992 and, following the launch on April 1996, prime responsible for the scientific operations. In 1997 Primo ricercatore and, as of 2002, Director of Research at Istituto Astrofisica Spaziale e Fisica Cosmica of INAF in Rome.

His primary research activity is High Energy and Relativistic Astrophysics. He is involved in the development of experiments and space missions of the European Space Agency and of the Italian Space Agency (ASI).

Principal Investigator of observational programmes with past and present astronomy satellites on Gamma-Ray Bursts and on galaxies harbouring black holes. He has published more than 150 articles publishes in refereed journals.

Organizer of about 30 scientific international conferences, in particular on Gamma-Ray Bursts and editor of the conference proceedings. Member of several national and international boards (IAU, ESA, NASA, ASI), referee of Astronomy and Astrophysics, Astrophysical Journal, Nature, Monthly Notices of the Royal Astronomical Society, book reviewer and column writer for Nature, he has been invited to deliver about 70 review talks in international conferences.

He was one of the leaders of the BeppoSAX team of investigators that solved the mystery of Gamma-Ray Bursts. In 1998 he and the team were awarded the Bruno Rossi Prize by the American Astronomical Society "for the discovery of the X-ray and optical afterglow of gamma-ray bursts, making possible the solution to the 30 year old problem of fixing the distances of gamma-ray bursts sources".

This result was classified by the "Science" journal in the top 10 most important discoveries made in 1997. It marked the beginning of a series of discoveries on these elusive phenomena for which he and an international team of scientists were awarded the 2002 Descartes Prize of the European Commission.



### **Tomaso Poggio**

Eugene McDermott Professor, Computer Science and Artificial Intelligence Lab, M.I.T., Cambridge, MA, USA

Tomaso A. Poggio, is the Eugene McDermott Professor at the Department of Brain and Cognitive Sciences; Co-Director, Center for Biological and Computational Learning; Member for the last 25 years of the Computer Science and Artificial Intelligence Laboratory at MIT; and, since 2000, member of the faculty of the McGovern Institute for Brain Research.

He is author or co-author of over 400 papers in the fields of learning theory, computer science, computational neuroscience, and nonlinear systems theory; and he belongs to the editorial board of several scientific journals.

He is an honorary member of the Neuroscience Research Program, a member of the American Academy of Arts and Sciences and a Founding Fellow of AAAI. He received several awards such as the Otto-Hahn-Medaille Award of the Max-Planck-Society, the Max Planck Research Award (with M. Fahle), from the Alexander von Humboldt Foundation, the MIT 50K Entrepreneurship Competition Award, the Laurea Honoris Causa in Ingegneria Informatica for the Bicentenario dell'Invenzione della Pila, from the University of Pavia and the 2003 Gabor Award.

His current research is focused on the development of the theory and on the application of novel learning techniques to computer vision, bioinformatics, computer graphics, and especially neuroscience.

His work in the last decade has been motivated by the belief that the problem of learning is the gateway to making intelligent machines and to understanding how the brain works.

Research on learning in his group follows three basic directions: mathematics of learning theory, engineering applications (in computer vision, computer graphics, bioinformatics, intelligent search engines and artificial markets) and neuroscience of learning, presently focused on the problem of how the brain learns to see-and in particular to recognize and represent objects in higher areas of visual cortex.

Earlier Prof. Poggio had worked with W. Reichardt in Tuebingen at the Max Planck Institut fuer Biologische Kybernetik on the visual system of the fly and with D. Marr at MIT on computational analysis of human and machine vision. He was responsible for the Vision Machine project at the AI Lab.

Professor Poggio received his doctorate in theoretical physics from the University of Genoa in 1970, had a tenured research position at the Max Planck Institute from 1971 to 1981 when he became Professor at MIT. A former Corporate Fellow of Thinking Machines Corporation, he is a director of PHZ Capital Partners, Inc., and was involved in starting several other high tech companies including Arris Pharmaceutical, nFX, Digital Persona, and Imagen.



### **Giovanni Puglisi**

Rector of Università IULM of Milan and President of The Italian National Commission for UNESCO, Italy

Giovanni Puglisi, born in Caltanissetta (Italy) in 1945, is the Rector of Università IULM of Milan and President of The Italian National Commission for UNESCO.

After taking a degree in Literature, he is appointed Assistant Professor of The History of Philosophy. Until 1972 he is Associate Professor of Philosophy of Language and Aesthetics at

the University of Palermo, Faculty of Literature and Philosophy.

In 1976 he becomes Professor of The History of Philosophy. Dean of the Faculty of Education Sciences at the University of Palermo, 1979 -98, and President of the Conference of Deans of Education Sciences Faculties, 1983-98.

He is President of the University Advisory Board for Cultural and Comparative Studies.

In 1993 he is Professor of Cultural and Comparative Studies at the University of Palermo.

At IULM, Libera Università di Lingue e Comunicazione, since 1998: since 28th March 2001 he has been Rector.

#### Other Professional Experiences:

He is President of The Foundation Bank of Sicily; The Foundation University IULM; ISIDA (Institute for the Higher Education of Managers, Palermo), The International Mondello Award for Literature and Società Siciliana per la Storia Patria (The Sicilian Society for Italian History).

He is Deputy-President of: The National Commission for the Promotion of Italian Culture at the Ministry of Foreign Affairs; The Foundation Città Italia; the Theatre Biondo-Stabile of Palermo.

He is Culture Councillor of Palermo.

He is a member of The Steering Committee UNESCO-ROSTE of Venice.

He is a member of the Administrative Board of: the Institute of the Italian Encyclopaedia G.Treccani

He is a honorary member of Società Geografica Italiana (The Italian Geographical Society).

He is a member of: The Rotary Club ( Roma Sud ) and he was awarded of Paul Harris Fellow.

Since 1972 he has worked as a journalist.

Research fields: Cultural Heritage Organization and Promotion, Cultural Policies, Art Trends, Cultural and Comparative Studies, Aesthetics and Philosophy.



## **Lisa Randall**

Professor of Physics, Harvard University, Cambridge, MA, USA

Lisa Randall studies particle physics and cosmology at Harvard University, where she is Professor of Theoretical Physics. Her research concerns the fundamental nature of particles and forces and the relationships among matter's most basic elements.

Prof. Randall has worked on a wide variety of models and theories, the most recent of which involve extra dimensions of space.

She has also worked on supersymmetry, Standard Model observables, cosmological inflation, baryogenesis, grand unified theories, and aspects of string theory.

She has made seminal contributions in all these areas and as of last autumn, was the most cited theoretical physicist of the past five years.

Professor Randall has recently completed a book entitled *Warped Passages: Unraveling the Mysteries of the Universe's Hidden Dimensions*, which was included in the *New York Times*'s 100 notable books of 2005.

Professor Randall earned her PhD from Harvard University and held professorships at MIT and Princeton University before returning to Harvard in 2001.

She is a member of the American Academy of Arts and Sciences, a fellow of the American Physical Society, and is a past winner of an Alfred P. Sloan Foundation Research Fellowship, a National Science Foundation Young Investigator Award, a DOE Outstanding Junior Investigator Award, and the Westinghouse (now Intel) Science Talent Search. In 2003, she received the Premio Caterina Tomassoni e Felice Pietro Chisesi Award, presented at the University of Rome, La Sapienza.

In 2006, she will receive the Klopsted Award from the American Society of Physics Teachers (AAPT).

Prof Randall was also featured in *Newsweek*'s *Who's Next* in 2006 and in *Seed Magazine*'s *Year in Science Icons*. She has helped organize numerous conferences and has been on the editorial board of several major theoretical physics journals.



### Courtney Sale Ross

Educational philanthropist and Chair of Ross Institute for Advanced Study and Innovation in Education, New York City and Founder of Ross School, East Hampton, USA

Ross Institute for Advanced Study and Innovation in Education serves as an incubator for 21st century education. It facilitates Ross School's entry into public school systems, acts as a catalyst for research in areas such as Globalization in Education, Mind, Brain and Education and Interdisciplinary Curriculum for Cultural

Understanding. Ross Institute's Inter-University Consortium was founded in 2004.

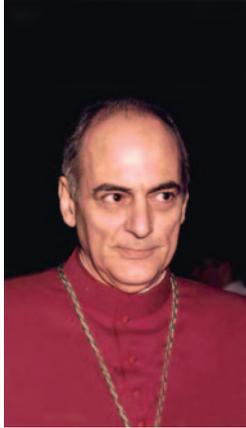
It is a network of universities whose schools of education will utilize Ross School as a lab school, and through teacher training the partners' findings will be disseminated to public education, primarily in underserved areas.

Founded in 1991 Ross School teaches the whole child for the whole world. The school's multi-disciplinary curriculum presents global cultural history as an outwardly-expanding spiral, enabling multiple perspectives onto past and current history. Ross School serves children from age 2 through the 12th grade. In the 2006-2007 academic year the school enrollment will number almost 550 students.

In 2006, the New York State Board of Regents approved the charter for the Ross Global Academy which is a collaboration with New York University's Steinhardt School of Education and New York City's Board of Education. The charter school is scheduled to open in New York City in fall 2006. Courtney Sale Ross' philanthropy is focused on education, emphasizing the underserved, globalization, and U.S./China relations. Ross has given to major universities across the United States including Harvard University, New York University, the University of Southern California and Skidmore College. At New York University's Tisch School of the Arts, Ross created the Courtney Sale Ross Scholarship Fund for aid to minority women. At NYU's Steinhardt School of Education, Ross' daughter, Nicole, established the Courtney Sale Ross University Professor of Education and Globalization Chair.

Ross' giving extends to the People's Republic of China where she has endowed museums with contributions related to education and research. At the Shanghai Museum, Ross created the Courtney and Steven J. Ross Multi-Media and Communications Center, an interactive theatre designed for use by international scholars.

Ross serves on boards with special emphases on education, wellness and international relations, including New York University, the Asia Society, the Brain and Creativity Institute at the University of Southern California, the Committee on U.S./China Relations, and the United Nations Association of the United States of America.



## **Marcelo Sánchez Sorondo**

Chancellor Pontifical Academy of Sciences, Vatican City

Marcelo Sánchez Sorondo was born in Buenos Aires, Argentina, on 8 September 1942. He was ordained priest on 7 December 1968 in the archdiocese of Buenos Aires.

He was awarded a PhD *summa cum laude* in sacred theology by the St. Thomas Aquinas University of Rome in 1974.

He also gained an undergraduate degree in philosophy from the University of Perugia in 1976, obtaining highest possible marks.

From 1976 to 1998 he was lecturer in the history of philosophy at the Lateran University in Rome where from 1982 onwards he was full professor.

He was dean of the Faculty of Philosophy at the same university for three consecutive terms from 1987 to 1996.

Since 1998 he has been full professor of the history of philosophy at the Libera Università Maria SS. Assunta (Rome) and in the same year was appointed president of the degree course in education science.

In November 1998 he was appointed Chancellor of the Pontifical Academy of Sciences and of the Pontifical Academy of Social Sciences, by Pope John Paul II.

In March 1999 His Holiness also appointed Mons. Sorondo as Secretary Prelate of the Pontifical Academy of St. Thomas Aquinas.

On 6 March 2000 he was conferred the knighthood Cavaliere di Gran Croce by the President of the Italian Republic.

On 15 February 2001, the Catholic University of the Sacred Heart awarded him the Francesco Vito Prize.

On 3 April 2002 the President of the French Republic conferred on him the Ordre National de la Légion d'Honneur; on 12 July 2004 he received the Neruda Award from the Chilean Ambassador to the Holy See.

On 25 August 2004 he received the Decoration Grão Mestre da Ordem de Rio Branco from the Brazilian Embassy to the Holy See.

**Ian Tattersall**

Division of Anthropology, American Museum of Natural History,  
New York, USA

Ian Tattersall is currently Curator in the Division of Anthropology of the American Museum of Natural History in New York City. Born in England and raised in East Africa, he has carried out both primatological and paleontological fieldwork in countries as diverse as Madagascar, Vietnam, Surinam, Yemen and Mauritius.

Trained in archaeology and anthropology at Cambridge, and in geology and vertebrate paleontology at Yale, Tattersall has concentrated his research since the 1960s in two main areas: the analysis of the human fossil record and its integration with evolutionary theory and the study of the ecology and systematics of the lemurs of Madagascar.

Tattersall is also a prominent interpreter of human paleontology to the public, with several trade books to his credit, among them *The Monkey in the Mirror* (2002), *Extinct Humans* (with Jeffrey Schwartz, 2000), *Becoming Human: Evolution and Human Uniqueness* (1998) and *The Last Neanderthal: The Rise, Success and Mysterious Extinction of Our Closest Human Relatives* (1995; rev. 1999) as well as numerous articles in *Scientific American* and the co-editorship of the definitive *Encyclopedia of Human Evolution and Prehistory*.

He lectures widely, and as curator, has also been responsible for several major exhibits at the American Museum of Natural History, including *Ancestors: Four Million Years of Humanity* (1984); *Dark Caves, Bright Visions: Life In Ice Age Europe* (1986); *Madagascar: Island of the Ancestors* (1989); *The First Europeans: Treasures from the Hills of Atapuerca* (2003); the highly acclaimed *Hall of Human Biology and Evolution* (1993), and its successor *Hall of Human Origins* due to open at the end of 2006.



### **Lodewijk Woltjer**

Professor of Astronomy and Astrophysics. Haute Provence Observatory, France

Lodewijk Woltjer studied at Leiden University in Holland.

He was Rutherford Professor of Astronomy and Chairman of the Astronomy Department of Columbia University in New York from 1964-1974 and from 1975-1987 Director General of the European Southern Observatory (ESO), located first in Geneva

and subsequently in Garching near Munich and with observatories in Chile.

He was President of the International Astronomical Union 1994-1997 and Chairman of the Space Science Advisory Committee of the European Space Agency (ESA) 1992-1996.

For several years now he has been associated with the Observatoire de Haute Provence in France and with the Osservatorio Astrofisico di Arcetri in Florence, while living mainly in Geneva, Switzerland.

He is the author of "Europe's Quest for the Universe" and of numerous articles.

## **VENICE CHARTER**

Participants of First World Conference on the Future of Science believe it of vital importance that the world community realises we are on the threshold of a new era of knowledge. Science impacts all fields of human life and explosive growth of knowledge in areas such as genetics, astrophysics and information technology will lead to an even greater influence on human activities. Scientific knowledge offers us the possibility not only of improving the conditions of life for all, but also of radically changing the biological makeup of living organisms. Humanity must be aware of the new freedoms and responsibilities these advances imply.

Participants are also aware that this enhanced potential of science generates unanswered questions about its applications, and reasonable doubts about its possible misuse.

The signatories of this Charter believe science will continue to be vital for the progress and well-being of humanity; however the issues raised by scientific progress must fully and openly debated by the whole of society. They therefore undertake to:

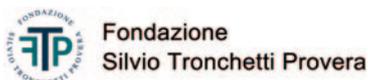
1. Create an alliance for scientific development – involving scientists, philosophers, theologians, politicians, industrialists, jurists, and all interested parties – which will oppose the isolation of science by promoting constructive dialogue between all forms of knowledge that respect human identity and dignity. Maximum priority must be given to harmonising the scientific and religious world views, reconciling ecology movements and science, and inserting scientific issues into political programmes worldwide.
2. Actively reaffirm the humanism of science, its intrinsic spirit of tolerance and incompatibility with absolutism in all its forms. Only if it reasserts these principles can science and other fields of endeavour hope to continue pursuing the fundamental aims of promoting civilisation and protecting human life. While basic research will expand the horizons of knowledge, applied research must be concerned with goals that are essential for the future of humanity, including the eradication of poverty and hunger, reduction of child mortality, conservation of ecosystems and bio-diversity, elimination of pollution, improvement of energy efficiency and reduction of fossil fuel use, reduction of the toll taken by HIV, malaria and cancer, provision of water for agriculture and uncontaminated water for drinking.
3. Promote scientific thought and the scientific method as a way of investigating and understanding the world, particularly among young people and in societies that have not attained an adequate level of material progress. The universal language of science and the rationality of the scientific method are unifying elements having the potential to bridge deep differences in culture, experience and faith, making constructive dialogue possible. The importance of encouraging interest in science in young children has been recognised by UNESCO, with its Declaration and Programme in Science and Technology Education.
4. Set up a permanent Authority for Science consisting of scientists, philosophers, theologians, industrialists, jurists, politicians and others, whose task will be to suggest the objectives and limits of scientific progress and to make rational proposals for the society of tomorrow. The Authority for Science will not be a group of super-technicians deciding in the name of all, but a committed team that systematically and conscientiously examines the problems posed and the opportunities offered by continuing scientific progress, and periodically submits its deliberations and conclusions to governments and public opinion.

Venice, September 23, 2005

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